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SPECIAL REPORT: The Plight of the Brazilian User

ADVANCED TECHNOLOGY GROUPS

Corporations Bet on Teams With the Right Stuff To Explore Technology Frontiers

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Users Await Fruitful DEC/Apple Yield

Database Machines: The Least-Cost Route?

Can IBM Revive the RT PC?

Private Networks: The End of an Era?

Sales Force Automation Is More Than Laptops

NOV 1, 1988

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FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

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Cover Photography by Walter Wick

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INSIDE DATAMATION

Improvement: A Constant Challenge

Form has always followed function at DATAMATION. From its inception in 1957, the magazine has served but one function: to help managers of information technology use software, systems, and communications tools, as well as related services, to their organizations' fullest advantage. However, the form in which DATAMATION's editors have chosen to deliver that benefit has by necessity changed with the times. Whenever readers have indicated they have new or different informational needs, the magazine has responded quickly—increasing its frequency, adding more case histories, broadening its international perspective, etc.

So it should hardly come as a surprise to you to see that with this issue, DATAMATION initiates a redesign aimed at better fulfilling its purpose—helping you. Some changes are more obvious than others—our logo is different, this column is new, opinions are more numerous, articles are more plentiful. But I urge you to pay attention to all of them, especially our Information Economics department, and let us know what you think of our progress. You can use the card opposite this page, call me at (212) 463-6431, fax me at (212) 242-6987, send an MCI mail message to DATAMATION/T. Mead, or write to me at 249 W. 17 St., New York, NY 10011.

THE REDESIGN TEAM: Lascaro, Hallock, Walker, Montalbano, and Stern.

The redesign process did not begin at a particular spot or at a particular time. It has been an ongoing pursuit at the magazine during its entire 31 years. Editors have constantly engaged in reader research—qualitative and quantitative—to determine whether DATAMATION delivers the right information in the best possible way to its audience. What has been found in recent years is an increasing tendency among IS executives at user organizations to distinguish DATAMATION as their chief source for in-depth, analytical stories about technologies and the management of them. Given this trend, it only made sense for us to examine whether the design of the magazine was enabling DATAMATION to fulfill its role as best as possible.

The role itself came under intense scrutiny before the redesign was undertaken. In early June, the magazine's editors invested a week of their time to decide DATAMATION's precise editorial mission. They agreed, remarkably, that DATAMATION was right on target with the direction it had embarked on a year earlier: focusing on the five greatest challenges facing its readers:

—Implementing new technologies
—Managing personnel inside and outside the IS organization
—Connecting dissimilar systems
—Protecting existing investments in technology
—Understanding where information technology fits in their core businesses.

Once we determined there was a better way to deliver information to you, the task of actually redesigning DATAMATION fell to six talented individuals. Barrie Stern, James Montalbano, and Bob Lascaro focused on the creative aspects of the redesign, while Hernalee Walker, Gary Hallock, and Harris Salat worried about implementing their efforts on our Atex text processing system. We trust you will be satisfied with their efforts.

Again, please share your thoughts with us.

Tim Mead

—Tim Mead, Editor-in-Chief

DATAMATION

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Can IBM Revive The RT PC?

The RISC-based system has attracted few users so far, but Big Blue is expected to add capabilities early next year that could improve its life expectancy.

BY SUSAN KERR

Ever since its debut almost three years ago, IBM's RT system has been a computer in search of users.

Initially, heralded as a system destined to become a standard, the RT has failed to deliver. Instead, it is more notable today for its long list of product firsts for IBM: it's the first standalone system for computer aided manufacturing and engineering, the first product based on RISC technology, and the first significant product supporting Unix. Even with the enhancements that are expected in early 1989, observers still wonder whether the RT will ever live up to its technical promise and find happiness in the IBM product portfolio.

The expanding market acceptance of RISC and Unix should mean a new life for the RT, since IBM has become vocally aggressive with both technologies. This summer, it contacted competitors and warned them of potential infringement of its RISC patents. It has also announced that it will run Unix across a full range of products, including its high-end PS/2 microcomputers, and it is a cofounder of one Unix standards group, the Open Software Foundation.

Moving to Micro Channel

The new systems that IBM is expected to announce in the first half of 1989 should clear up what users term the number one technical constraint on the RT: the 32-bit systems' use of the old 16-bit AT bus. By moving to the 32-bit Micro Channel Architecture, the I/O structure made famous by the PS/2 family, faster I/O and file devices can be attached to the RT. In addition, IBM may introduce a version of the RT with both built-in RT RISC and 80386 processors. IBM currently offers an AT coprocessor option for the RT.

The absence of a 32-bit bus on what is supposed to be a technical workstation is one example of the RT's skittish nature. To date, IBM has appeared hesitant in its marketing and design of the RT. The product has been too underpowered and overpriced to compete on an equal footing with other CAE and CAD/CAM workstations.

No longer. Art Goldberg, IBM's director of business development AIX systems in the personal systems line of business, admits that Big Blue announced the original RT knowing that there were gaps in the product, but he promises that IBM now plans to double the RT's performance at a constant price every 12 to 18 months of its foreseeable future.

Despite these holes, there are a few happy commercial RT users who are assured that IBM should be more aggressive in their markets and is becoming so.

"IBM's just started pushing the RT in this area," says Chris Irwin, technical consultant for WCI, Washington, D.C. His company recently agreed to handle the RT as a member of IBM's Marketing Assistance Program. Irwin's first RT customer will use it as the host for a financial database as well as for word processing. "This is definitely not what you'd consider a standard technical application," he notes.

Another RT commercial user is Jim Robinson, director of marketing administration for the Farm Bureau Insurance Group, the Lansing-based affiliate of the Michigan Farm Bureau. This agency has roughly 100 field installations with RT systems processing policies and claims as well as performing general office applications.

"I've told IBM that they were missing the boat," says Robinson. "From our vantage point they have a commercial system here."

Despite his generally high regard for the RT and IBM's service, Robinson believes the pool of available software needs to be improved. For example, the Farm Bureau has found no good spreadsheet package for the RT, nor any standard offerings for the insurance industry.

Big Blue's Technical Blues

IBM trails the pack in technical workstations

Company	Units	1987 Market %
Sun	34,100	29.6
Apollo	24,000	20.8
Digital	24,000	20.8
Hewlett-Packard	17,000	14.7
Silicon Graphics	5,750	5.0
Intergraph	4,060	3.5
IBM	3,400	2.9

AIX to the Rescue?

The push by IBM to get AIX, its version of Unix, on other platforms should help the software shortage. For example, last month AIX became available on high-end PS/2 models. IBM's Goldberg agrees that should help the number of software offerings for the RT. "The PS/2 and the RT are reasonably complementary today and will become more so over time," he says. "Clearly, AIX as a common operating system and the move to a common I/O base in

Micro Channel . . . will allow complete transparency at the AIX call level."

The promise that the RT enhancements could be moved to other IBM systems in the future was a big plus for Henry Maxwell, senior staff engineer for Harnischfeger Engineers Inc., a division of materials-handling giant Harnischfeger Industries, Milwaukee. The company used to be more involved with Digital Equipment Corp. systems, but today it uses the RT as part of a system to control forklift operations.

"Our basic intent is not to be in bed with the RT," says Maxwell. "Rather, it is to tell customers they can use what [hardware] they want."

Nonetheless, Maxwell adds that he has been pleasantly surprised by the RT's functionality. IBM has been marketing the RT exclusively as a CAD/CAM box, and in factories it has been pushing the 9370 minicomputer networked with PS/2 systems—both of which miss the mark, he believes. "What's missing in IBM's present factory scenario is the centerpiece: a real-time control computer," he says. "That can be the RT."

Missing the Engineering Market

IBM's been even further off the mark in the technical marketplace. There are no major RT oems in the CAE market. While Big Blue clearly defines the RT as an engineering, technical workstation, the system has not done well when compared to its PC and PS/2 brethren and a host of more popular systems from Sun Microsystems and Apollo. San Jose-based market research house Dataquest Inc. estimates that in 1987 IBM shipped 3,500 RTs for technical applications compared with Sun's 32,000 and Apollo's 23,000. An additional 3,500 RTs were shipped for nontechnical applications, such as those found in the financial and banking industries.

"To the best of my knowledge, no one in my area is using the RT," says Nilo Niccolai, manager of Hughes Aircraft Co.'s corporate VLSI support organization, Long Beach, Calif. Instead, the company has settled on Sun and Apollo as workstation platforms. "At one point, I think it was a question of raw power," and the RT's lack thereof, Niccolai says. "Now, people realize it is one of software." None of Hughes's major CAE and CAD software suppliers, such as Mentor Graphics Corp., Beaverton, Oreg., support the RT.

One technical software company that did support the RT has reconsidered its position. BBN Software, Cambridge, Mass., recently decided to halt active marketing of the RT version of its RS/1 engineering data analysis product. "Frankly, the sales performance of the RT has been pretty disappointing," says BBN marketing vp Thomas Kush, who places sales figures for the RT version of RS/1 at "fewer than 100." He reels off a list of reasons the RT has been constrained: "Distribution channels, graphics, software availability, performance of earlier version, pricing. Any one of those a company can overcome, but all five just isn't right."

Big Blue is coming around on some of these issues. First releases of the system were without high-resolution graphics and key networking capability such as Ethernet connectivity. These gaps have been steadily filled in, culminating last July in three new models whose main features were faster throughput and greatly needed improved floating point performance.

☐ **THE MAIN CONSTRAINT OF THE RT AS IT NOW EXISTS IS ITS PC AT BUS STRUCTURE.**

But there's still more to be done. In the first quarter of 1989, it is anticipated that IBM will continue along the lines it took this summer and introduce new versions with higher throughput and a new bus architecture.

The main constraint of the present RT is its AT bus structure, even though IBM says it runs at speeds up to four times that of a standard AT. Within Harnischfeger, engineers have found that they can do RT disk I/O to the mainframe over a token ring network faster than the RT can perform disk operations internally. Going to a 32-bit bus structure will significantly increase performance, Maxwell says. The most likely scenario calls for IBM to use the same Micro Channel bus used in the PS/2.

Has IBM Held Back the RT?

This is part of the RT's slow and steady improvement. Customers have not flocked to the system yet, but some believe there is still hope. Clare Fleig, systems research director for IBM watchdog International Technology Group, Los Altos, Calif., feels IBM has held back on the RT so as not to interfere with sales of other products. Yet, Fleig says there are indications that the RISC processor central to the RT is finding its way into other mainstream product lines such as the AS/400.

As the RT RISC technology melds into other families, the RT is melding more into IBM's personal computer strategy. One interesting signal of IBM's intentions was the introduction earlier this year of the 6152 academic system, an 80286-based microcomputer with a RISC chip on its motherboard. Goldberg says IBM has no plans to create an RT or RISC coprocessor for other commercial products such as the 9370 or AS/400, but, over time, it has altered its RT PC coprocessor strategy. IBM no longer offers a separate DOS coprocessor board for the RT. Instead, the latest versions of AIX include code that simulates the AT. No similar capability for the OS/2 is yet available.

IBM has wrestled over whether to differentiate its two lines of microcomputers or merge them. "Sure, there's a lot of overlap with the PS/2 and the RT running AIX," says Stephen Hill, director of product marketing for Informix, which gets roughly 2.5% of its business from RT software products. He believes that if IBM were truly to differentiate the two lines, one possible way would be to release a multiprocessor version of the RT system.

A New Song from IBM?

That's been a popular RT rumor for some time, but many are doubtful that IBM would produce a multiprocessor RT offering. IBM clearly has the technical know-how to make a superpowered RISC-based system. If it does so, however, it risks knocking the socks off other IBM systems that boast higher margins for the company. This could explain its rather cautious approach so far with the RT.

Yet, as IBM sees other RISC vendors doing well, it may be changing its tune. The RT architecture still has a lot of growth in it, according to Goldberg. "It clearly could include looking at multiple processor versions of RISC processors," he says. "I don't see any constraints within IBM. We're spending as much on RISC-based products as we are on Intel-based products."

Andrew Allison, editor of *RISC Management*, a Los Altos Hills, Calif.-based newsletter, believes that marketing forces within Big Blue are holding back the technology folks. "Can you imagine what a multiprocessor system would do to IBM's base?" he asks. "Their traditional margins on minis and mainframes just would not be supportable. The RT products that IBM has introduced do not by any means take advantage of their processor."

It's not just performance that IBM needs to work on concerning the RT. If IBM continues to soup up the RT's performance, it still must deal with three years of inertia and a mediocre reputation. That's tough, even for a marketing giant.

Automating The Japanese Office

Japanese corporations trail the West in applying new office systems technology. Keyboard-phobic Japanese managers, cultural tradition, and the slow process of establishing standards in desktop systems are limiting OA use.

BY JOHN BOYD

Yoshihisa Akai is an IS manager with a major cultural obstacle to overcome. As the director of the strategic analysis group at Japan Air Lines (JAL) in Tokyo, he has spent the last few years building up a $3.5 million database system for JAL's executives, including the board of directors and the president. The system provides vital decision-making information to help JAL pilot its way through the competitive dogfights of the international airline business. "It has now become indispensable to use this information in planning strategies," notes Akai.

Despite their active support for this high-tech investment, JAL's senior managers are reluctant to access that vital data themselves. Virtually all the information is still delivered to them in hardcopy form through intermediary staff.

This is not unusual in Japan. Direct management involvement with office automation is still rare in most large Japanese organizations.

"In terms of pure technology, the U.S. and Japan are about the same, but in applying that technology, the U.S. is more advanced, perhaps as much as five years," comments Shuhei Mitome, an analyst at Arthur D. Little Japan Inc. in Tokyo.

The U.S. got off to a good start in the early 1980s when the growing number of word processing users and suppliers greeted the pc revolution with open arms. Japan, however, had first to deal with the awesome task of automating *kanji*, the Chinese characters that are used in the complex Japanese writing system, before it could advance.

☐ **DIRECT INVOLVEMENT BY MANAGEMENT WITH OFFICE AUTOMATION IS STILL RARE IN MOST LARGE JAPANESE COMPANIES.**

To be considered literate, a Japanese must learn at least 2,000 *kanji* characters, many composed of between 10 and 20 strokes. That compares to a maximum of only four strokes in the 26 letters of the Roman alphabet. It is this complexity that has made *kanji* difficult to reproduce on small screens and in business documents.

Progress has been made. Today, Japanese users enter information via a keyboard based on either Roman letters or phonetic syllabaries called *kana*, which the computer then converts into *kanji*. While some complain that input is slow, most Japanese believe the technical problems are a thing of the past.

The result is that the spread of word processors (*waapuro*), which began around 1984, shows no signs of diminishing. Notes Mitome, "While sales of dedicated word processors decline in the U.S., they're continuing to increase here."

Nevertheless, there is still widespread management resistance to using keyboards. With few exceptions, computer input is regarded as the job of a trained

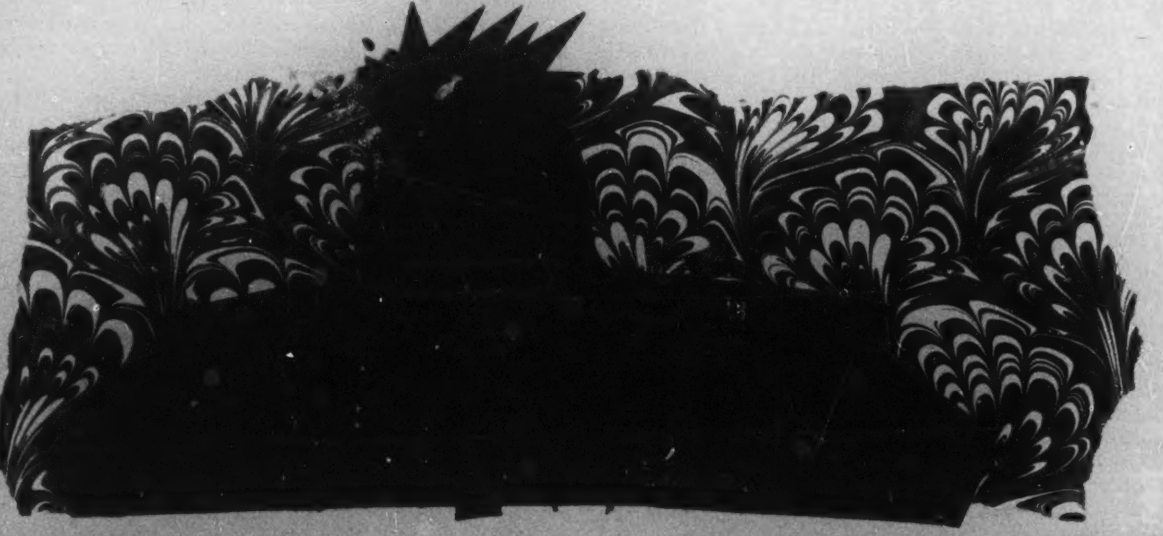


Illustration by Peter Kuper

worker, usually one of the so-called office ladies who grace Japanese offices.

"The OA [office automation]-ization of Japan is still mostly an entry operation by women who are trained to input data," says Linda Sherman, project director for the Japan Market Research Bureau Inc. in Tokyo. "In the U.S., a lot of people are making good use of their personal computers through spreadsheets and word processing; they're creating, moving information around in a document until it suits them. In Japan, word processing still means creating a document by hand and having a secretary produce 'pretty print' on a word processor."

What's Wrong with a Quill Pen?

This is less surprising when it's understood that the typewriter was never used as widely in Japan as in the West. Until recently, all documents, except a few pertaining to government and legal matters, were handwritten. This tradition, deeply rooted in an artistic admiration for the handwritten document in Japanese culture, explains the popularity of the facsimile machine, by far the most commonly used business machine in Japan, because it is better suited to customary methods.

"The fax is one of the gadgets of the information society," says Robert Ballon, professor of economics at Tokyo's Sophia University. "The Japanese may not be using e-mail as much, but given that they practically sleep with a fax on their laps, well, you just add a new button to the fax and you have e-mail. That is only a technical twist."

In an effort to overcome the keyboard phobia among Japanese managers, many companies have tried to simplify the task of inputting *kanji*. At Toshiba in Tokyo, systems personnel have devised plastic keyboard overlays for executive workstations that mark the keys according to function and are tailored to the individual executive's department.

□ IN THE UNITED STATES, A LOT OF PEOPLE ARE MAKING GOOD USE OF PERSONAL COMPUTERS; IN JAPAN, WORD PROCESSING STILL MEANS CREATING A DOCUMENT BY HAND.

Akai at JAL, meanwhile, hopes to introduce terminals specially tailored for computer-shy management next year so that they can access his database information directly. "This will cost an additional ¥200 million or ¥300 million. I will also need one or two more staff—and they are particularly hard to get," he says. JAL plans to follow the example set by the Tokyo Electric Power Co., which uses a two-key keyboard and a numeric keypad to select menued items on a screen.

While it may take time to break down the barriers between JAL's management and the keyboard, Akai has noticed that other aspects of traditional Japanese management style have already been affected by the introduction of office systems linked to the information database.

"In the past, management has often been by intuition and *hara* [gut feeling]," Akai says, "but with the introduction of this system, I hope it will change more to management based on actual and accurate information. And I'm beginning to see such a change."

What's more, access to the system has helped staff assess changes faster and better focus their activities. "For instance," he reports, "if we introduce a new fare, we can know the results in a month or so, whereas before it took at least a month longer."

Whereas the sales staff once had the simple goal of "selling more," Akai continues, they are now using the newly available information "to make more profit"

A Network of Laptops At Toshiba's Head Offices

Naoto Yokoyama, like many managers in the internal information and systems division at Toshiba's headquarters in Hammatsucho, Tokyo, uses a J3100 laptop every day for an office application that is still exceedingly uncommon in Japan—e-mail.

"While fax is used much more than e-mail today, the use of e-mail will increase because of its advantages," says Yokoyama. He can check for mail four or five times a day, broadcast messages, and receive a confirmation of receipt.

Yokoyama hooks into the 100Mb optical fiber LAN that runs around the 40-story building. Linked to this are 10Mb coaxial systems that bring distributed data processing to each department. "This network is also connected to other Toshiba offices, plants, and buildings throughout Japan via our group's value-added network," he explains.

This network has been a major success at the Toshiba headquarters. All eight senior managers in the IS division are using e-mail to varying degrees.

One such manager is Kenjiro Hayashi, who has offices in both the telecommunications and planning departments, and so praises the portability of his laptop. Hayashi is presently gathering information in preparation for planning a global communications network for Toshiba.

He demonstrates on his own laptop how he uses Lotus 1-2-3 to list, in any order, overseas branch and sales offices (600 locations in the U.S. alone) according, for example, to the kind of computers they use, whether they have dedicated or public fax, or just by their address. "I used this to analyze the traffic flow between cities here in Japan to find out where we should use private lease-lines. It can save us a lot of money," says Hayashi.

On an average day, Hayashi spends the first 30 minutes checking his e-mail. "I may have between five and 10 messages and two or three will request a response," he says.

The combination of laptop and network access has made another major difference to the way he does his work—he inputs all of his own data. "Before, I would ask an 'Office Lady' to type for me. Now, I do it all myself and can make new documents from what I've saved on the hard disk. More people know what I'm thinking, and I'm getting more done."

But Hayashi quickly admits that some managers even in his division still fear the keyboard. In the case of Toshiba's senior executives, the company has found a partial answer to keyboard phobia by developing a plastic template that sits over the keyboard and indicates key functions. "By pushing just one or two keys," says Hayashi, "an executive can get important business information at any time."

If senior managers in Japanese corporations are going to be persuaded to use office systems themselves, this kind of combined portability, network access, and user interface may be the answer to many Japanese IS managers' problems.

by concentrating their energies on more lucrative routes.

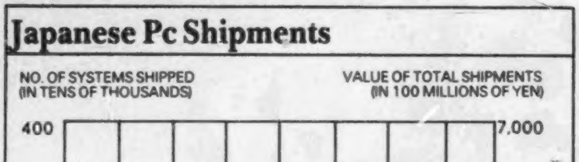
These glimmers of progress aside, there are still other problems facing IS managers hoping to implement widespread office systems in Japanese corporations. Incompatibility among desktop systems is a particular problem. For example, even though NEC Corp. grabbed over 80% of the 16-bit pc market with its 9800 series (something even IBM in the U.S. never managed to equal), it has not experienced the kind of high-volume corporate purchases typically seen in the U.S. Most larger companies have IBM mainframes or plug-compatibles made by Fujitsu and Hitachi, and obviously look first for pc and terminal compatibility with their big machines.

No Pc Operating System Standard

This failure to reach a common standard in the Japanese pc world extends to operating systems. Although every major manufacturer has decided on Microsoft's MS/DOS for its pc operating system, each has adapted the OS to suit its own ends and peripheral needs. "In personal computers nothing talks to anything yet," says the Japan Market Research Bureau's Sherman. "When you ask the Japanese why, they mostly say it's a matter of pride. Every manufacturer wants to have its own machine."

According to Susumu Furukawa, president of Microsoft Corp.'s Japanese subsidiary, this lack of an industry standard is the reason it took NEC five years to sell 1 million 9800 personal computers. "I worry about the growth rate of pcs in Japan," says Furukawa, who is trying to rally the industry to support a common MS/DOS standard, compatible with the classic IBM PC, called AX (Architecture Extended). "It's only 11% versus more than 30% in the U.S."

Even when the Japanese do get together and eventually agree on a standard, it may be a case of too little, too late. "One of the problems with these group standards is that by the time they put it together, it's old—like MSX," notes Sherman, who sees this slowness to react as the natural outcome of the Japanese tradition of consensus in decision-making, called *nemawashi*.



Japanese Pc Shipments

Source: Informatization White Paper, 1988; Japan Info Processing Development Ctr., Tokyo

Chart by Catherine Francis

Without a clear standard, software publishers must spread their resources, which hampers quality. Some observers believe indigenous Japanese business software is not up to the caliber U.S. managers have come to expect.

"Japanese packaged software is not easy to handle," says ADL's Mitome. "Data transfer from one application to another isn't easy or well structured. Other areas [such as] manuals are poor too."

☐ ANOTHER PROBLEM FACING JAPANESE MANAGERS HOPING TO IMPLEMENT WIDESPREAD OFFICE SYSTEMS IS THAT OF DESKTOP INCOMPATIBILITY.

Yet at least packaged software is available for the business pc user. In fact, a number of the popular business packages are simply Japanese versions of best-selling U.S. software from companies such as Lotus, Microsoft, and Ashton-Tate.

When it comes to more powerful business systems, *ofucon*, or office computers (IBM System/3X-class machines), firms insist on customized software. "Software for *ofucon* is almost entirely custom-made because the Japanese refuse to adopt business methods, and instead insist on adapting the system to the way they do things manually," says Sherman. "So, software is still unnecessarily expensive, which hampers real proliferation of those systems."

Nevertheless, things are hardly standing still. "The face of the Japanese office has changed dramatically," says Tom Zengage, director of research consultants International Business Information in Tokyo. "When I moved here 10 years ago, it was a different place: paper-filled offices with the odd *kanji* typewriter. Now, OA is here to stay."

But Zengage also sees the Japanese lagging behind the U.S. "You can still go through lots of offices where computers are used as decoration. Even at electronics makers, you can find computers unplugged . . . but they are catching up."

One analyst who believes Japan has already caught up is Tetsuo Fukuyama, a partner with Price Waterhouse in Tokyo: "Except in e-mail, where inputting is a problem, we're no longer really behind. If you have an open office, you don't need many terminals or pcs; you can share them."

Sophia University's Ballon thinks the Japanese may not have caught up in the race to automate the office, but, he asks, "Generally speaking, are we so much better off in the West? That I question, because even in the West we are still quite inept at using all the available numerical data."

Ballon adds a warning for U.S. managers tempted to underestimate the Japanese. "Look at all the work of [quality control] circles here on cost reductions. Certainly, on the production side, this has brought about amazing results. Why shouldn't this same capacity work in the office? To use [the OA gap] as a sign of superiority of the West over Japan would, I think, be a very childish kind of reasoning."

John Boyd is a freelance journalist in Yokohama, Tokyo. He has lived in Japan for 15 years and has written for numerous business and technology publications in Europe, the U.S., and Japan.

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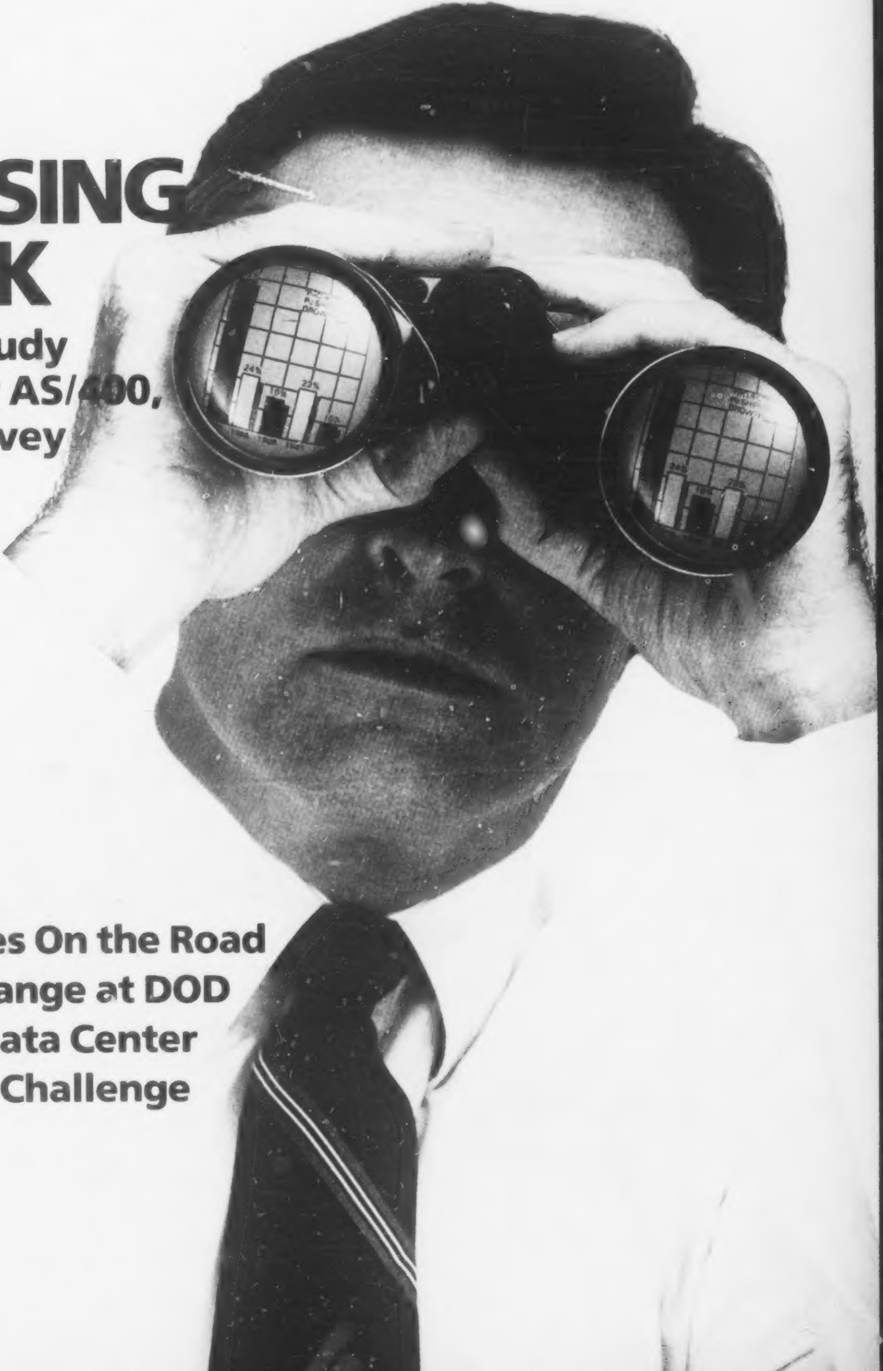
DATAMATION®

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

THE PURCHASING OUTLOOK

Future Seems Cloudy for PCs, Bright for AS/400, in Mini/Micro Survey



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Document Interchange at DOD

Shaping Up Your Data Center

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FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

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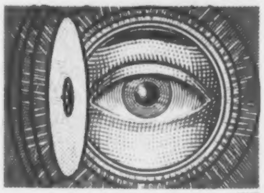

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Industry-Specific Advice, Solutions, Applications 100-1

EDITED BY LINDA RUNYAN The first of a series of special editions reporting on products, services, and methodologies for specific industrial sectors. This issue's *Sectors* is for IS and business unit managers in banks, brokerage firms, insurance companies, real estate firms, and other financial institutions. Later editions will serve managers in manufacturing, government, and the retail/wholesale trade. (Not included in all issues.)

SPECIAL SUPPLEMENT

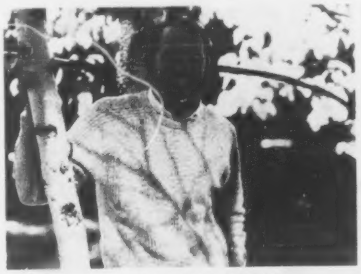
BUDGETS

Industry-by-Industry IS Spending Survey

A DATAMATION REPORT This year, IS's cut has risen to 1.9% of revenues, and the total of the budgets for information systems at the top 120 companies in 12 industries will be $32 billion (see accompanying supplement).

Good Minds Hard at Work

This issue, known annually as our mini/micro report, might be more properly named our Mini/Micro/McWilliams edition. In a period of three weeks, Boston Bureau Manager Gary McWilliams somehow managed to span the West Coast and East Coast for us, interviewing Oracle Corp. executives at their Belmont, Calif., headquarters one week, and sitting through an intense four days of CEO presentations at our annual mini/micro conference in Boston the next. Along the way, he found time to track down several of Oracle's customers and competitors as part of his profile, "Oracle's Olympian Challenge" (p. 31); analyzed a couple hundred pages of survey data from our poll of 5,000 PC, workstation, and minicomputer users before authoring our 1988 Mini/Micro report (p. 18); and touched bases with AT&T, ADP, DEC, and IBM and several of their customers about what they were doing in electronic data interchange for his "Banks, Network Providers Eye EDI," (p. 77).


MARATHON MAN MCWILLIAMS

Whew!

Not that McWilliams' colleagues were resting on their laurels, mind you. San Francisco Bureau Manager Jeff Moad, who's been following IBM's Systems Applications Architecture with the same fervor that Harvard's Ted Levitt approaches marketing issues, discovered that few users and third-party software developers are using CSP despite IBM's promise that applications developed with the language would someday be able to migrate easily among any of IBM's chosen hardware platforms—370 machines, the AS/400, or the PS/2 family. In "CSP: The Weak Link in SAA" (p. 49), one user even told Moad that CSP was far from being the industrial strength 4GL needed by his organization.

San Jose Bureau Manager Susan Kerr, meanwhile, crossed into Washington Bureau Manager Willie Schatz's territory in pursuit of a communications story on how the Department of Defense was using technology to reduce the amount of paperwork required to do business with DOD. That's right, a cutback at Defense without a politician's whimper! "Document Interchange Reigns at DOD" (p. 81) details the agency's efforts to implement its computer-aided acquisitions and logistics support (CALS) program—must reading for any government contractor or for any other manufacturer trying to streamline its communications with key suppliers. Schatz, by the way, was on a three-week pass from government duty, spending his time preparing a status report on computer-integrated manufacturing, the subject of an upcoming cover story.

Two additional stories that merit your attention came from external resources. Mark Halper, a well-known journalist in electronics circles lapped up all the information he could find on laptops, finding that the mighty midgets are remaking the sales and accounting professions in "Portables Get Raves on the Road" (p. 55). And Jan Rypdal, managing director of FD Software in Norway, cleared up what's going on in the CICS domain in "What's Ahead for IBM On-Line Systems," (p. 69).

Tim Mead

Tim Mead, Editor-in-Chief

Photograph by Julie Houck

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THE PURCHASING OUTLOOK

The new Datamation/Cowen & Co. 1988/89 Mini-Micro survey reveals a cloudy horizon for PCs; but IBM's new AS/400 will bolster the prospects for minicomputers overall.

BY GARY McWILLIAMS

For the past seven years, the one certainty in the DATAMATION/Cowen & Co. annual survey of mini/microcomputer purchase plans was the yearly double-digit growth in PC spending and shipments. No more. PC purchases are falling, knocked off course by the crosswinds of operating system and applications software changes and the rising demand for local area networks.

According to an extensive poll of 5,257 DATAMATION readers conducted in July and August, PC unit shipments will fall by 5%, the first decline recorded since readers began reporting their purchase plans in the late '70s. The decline compares with a 21% unit shipment growth projected in 1987. In dollars, a modest 10% growth rate is forecast, down from 23% forecast by survey respondents in the prior year.

In some ways, the PC now appears to have as many gray hairs as the minicomputer. The abundance of new PC users that was once seen entering the survey population is no longer. In fact, the rate of first-ever PC installations among this year's survey group equals that of the mature minicomputer arena.

> One reason for the slowdown could be that new software to take advantage of more advanced PCs is not yet available.

The relatively slow transition to more powerful PCs and software suggests another reason for the slowdown in buying intentions. Respondents' purchases of 32-bit IBM PS/2 models, although growing, make up less than a fifth of the coming year's total PS/2 acquisitions. By far, the mainstay PC applications also continue to be those packages that first rallied around the original IBM PC. That old faithful, word processing, remains the most widely used PC application. Taken together, the two factors may suggest that the new generation of software to take advantage of the 32-bit technology has not yet emerged. Two current examples are the delays in Lotus's 1-2-3, release 3, and Ashton-Tate's dBase IV.

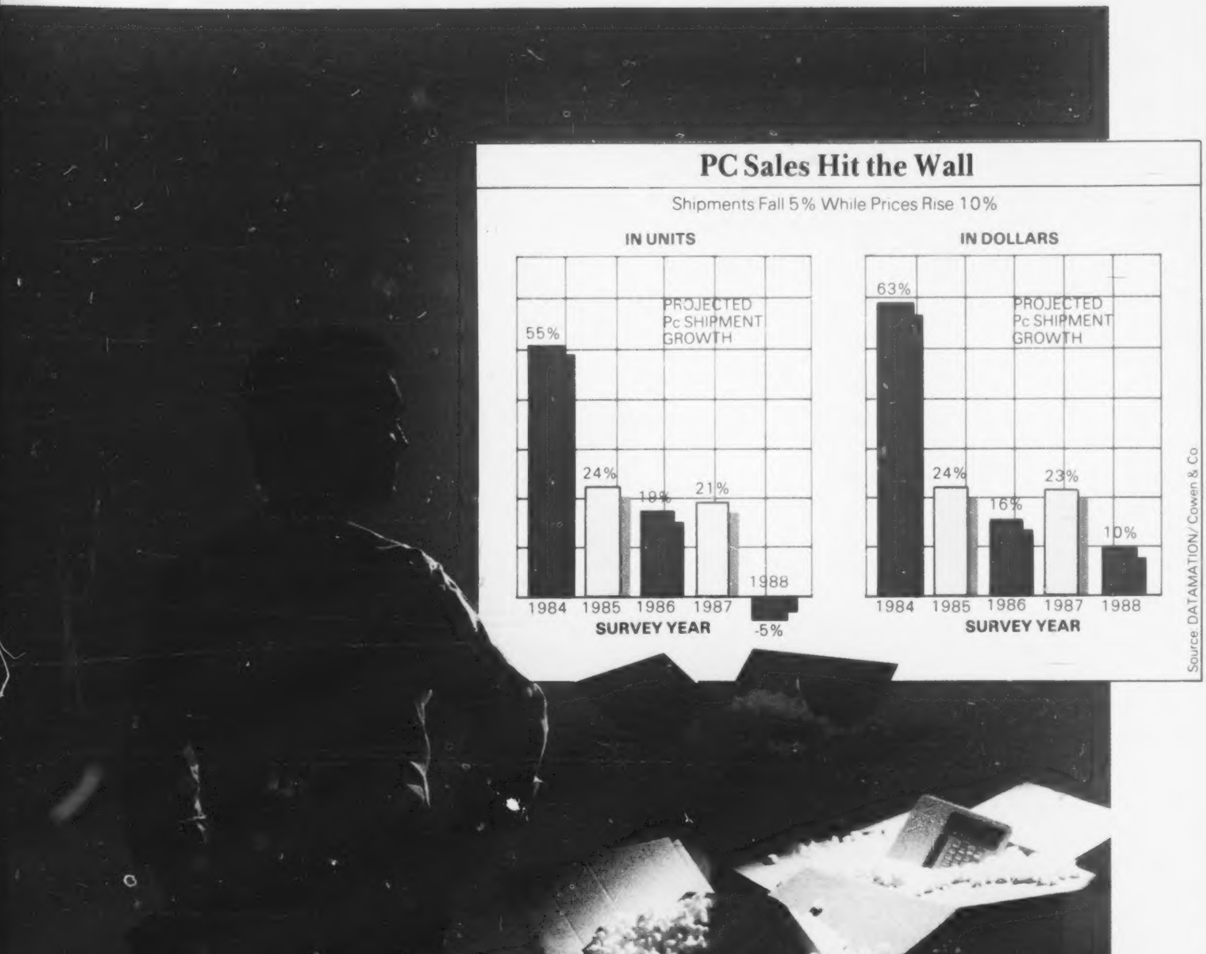
As this year's survey results illustrate, new gains for both the PC and minicomputer may now depend largely on replacement plans. The driving force in that regard is IBM's AS/400. Announced just prior to this year's survey, the AS/400 has rocketed to the lead spot in respondents' anticipated minicomputer purchases both in unit volume and dollar value. And the effect on the overall minicomputer market has been telling. Respondent purchases promise to send overall minicomputer buys up 15.3% in dollars for the 12 months ending June 1989—topping last year's projected 14.4% increase among the survey population.

Minicomputer shipment revenues, however, will rise only 8.5% when AS/400 purchases are normalized to last year's Systems/3X revenue level. In that light, minicomputer growth overall continues at the single-digit level first set in the 1986 survey.

Again this year, new applications are twice as likely to be hosted on PCs and workstations for both office/MIS and scientific/engineering/factory applications. The shift away from minis in the office has leveled off, suggesting that for at least this year IBM's AS/400 and Digital Equipment Corp.'s MicroVAX have stemmed further PC/workstation inroads there. In the technical arena, workstations are still taking new applications away from minis.

The strong showing by the AS/400 promises to overshadow DEC's midrange gains. Even though in the last 18 months IBM garnered about 21% to Digital's 37% of minicomputer purchase dollars, IBM pulls abreast of DEC in new purchase plans. Each looks to gather about a third of the $860 million respondents plan to spend on minis in the 12 months ending July 1989. For DEC, a revitalized IBM and lingering problems with its resellers suggest the bloom may be off the rose in Maynard.

Neither DEC nor other minicomputer makers, however, appear to be in mortal danger from IBM's rising stature and the favorable reaction to the AS/400. Perhaps not surprisingly, purchases of the new IBM mini are confined largely to existing IBM System/36 and 38 users. Among IBM mini rivals, only NCR users report sizable interest in evaluating the new line. The new

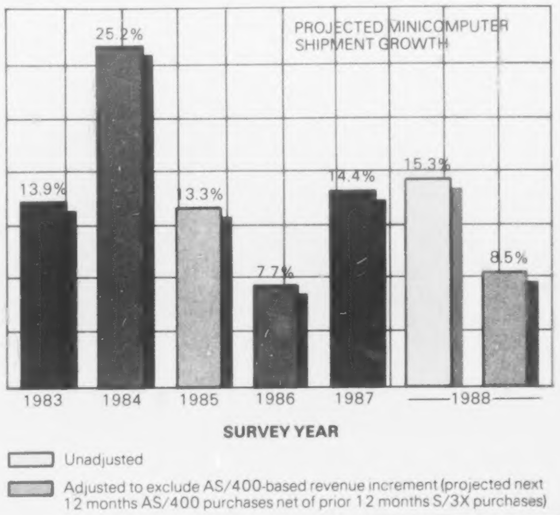


Source: DATAMATION/Cowen & Co.

Photograph by Walter Wick

AS/400 Drives Mini Growth

IBM's Midrange System Accounts for Half of Industry's 15% Growth



Source: DATAMATION/Cowen & Co.

mini's impact is likely to be on used Systems/3X prices. Over 65% of Systems/3X users aiming to acquire AS/400s plan to sell their existing systems in the used market.

Those hoping to fund part of their AS/400 purchase by selling their existing systems could be in for a surprise. Just as plummeting 308X mainframe prices three years ago slowed IBM 3090 sales, so too could the potential glut of used equipment derail some planned AS/400 purchases. The largest share of AS/400 purchase plans occur among respondents at companies with annual revenues in the $11 million to $250 million range. In contrast, those at companies with less than $10 million in annual revenues—a group targeted by IBM for the new midrange line—are less interested. Only 6.3% of respondents at these small businesses say they will respond to IBM's AS/400 entreaties.

Despite the power IBM is showing in the midrange, Big Blue is not without its soft spots. The most prominent is in PCs. IBM continues to lose ground to clone makers in users' upcoming personal computer purchase plans. Among respondent sites, those planning to buy IBM PCs declines to 37%, the third consecutive year the number of sites favoring IBM has declined. Moreover, OS/2 is less accepted as a future standard among PC and compatible users than the key SAA operating system was a year ago. Plans to standardize on OS/2 slipped to 21% of IBM and compatible PC users from nearly 25% a year ago.

Survey respondents' subdued regard for the use of Unix on PCs makes the oft-mentioned contest between Unix and OS/2 unlikely anytime soon. The battle lines for this group are better drawn around OS/2 and Microsoft Corp.'s DOS operating system. DOS again this year is named by two thirds of respondents as their future PC operating system standard. Only

A Surge for IBM Across the Board

The AS/400 is the most dramatic evidence of a revitalized IBM in the eyes of this year's survey group. In four key categories—office systems, software availability, networks, and purchases by oems/systems house—IBM receives either a larger share of purchases or better grades than a year ago.

Based on these and the results of a spring polling of DATAMATION readers at mainframe sites, IBM appears poised to recapture the momentum lost in recent years to midrange and mainframe rivals Digital Equipment Corp. and Amdahl Corp. (see "The 1988 Large-Scale Systems Survey," May 15, p. 88).

The biggest boost for IBM has come from the AS/400 minicomputer and MVS/ESA mainframe operating system. Only in PCs, where OS/2 so far lacks the punch to help its PC fight, does IBM fail to stand toe-to-toe with the competition, according to survey data. Moreover, Big Blue's improved favorability ratings could also stem from the product and organizational changes that reflect a concerted effort to include users in its product deliberations.

Examples of this renewed approval from minicomputer users abound. For instance, after Stratus Computer Inc., IBM gathers the second largest improvement rating by users. Again, after Stratus, IBM users are this year least likely to consider a switch to another vendor, according to respondent rankings.

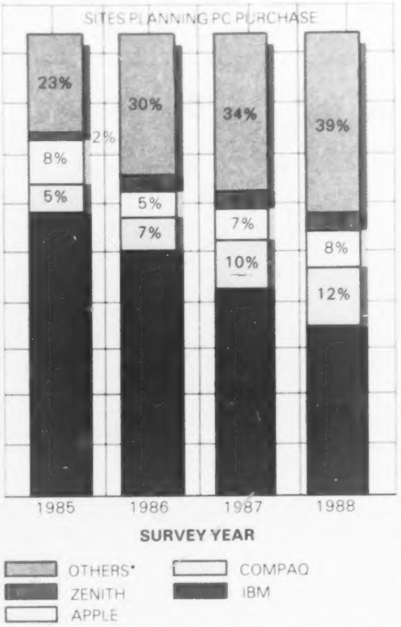
Among oems and systems house customers, only 5.4% this year say they are considering dropping or will drop IBM as their primary vendor. Three years ago, nearly 19% considered such a switch. In the competition for oem and systems houses, IBM shows up significantly more often than it did three years ago, and emerged as the runner-up nearly 17% of time this year in oem/systems house vendor selections. That's an improvement of more than 60% from the second place mentions it received in 1986.

IBM can also boast new gains in minicomputer software availability and quality. A spin-off benefit from the AS/400, which consolidates System/36 and System/38 operating environments, is that Big Blue is no longer plagued by the perception that its software is weak, according to the survey. This year, it is a close number two to perennial leader Digital Equipment Corp. in minicomputer software availability and quality.

But IBM does have some weaknesses to address, particularly in its support. Among mainframe survey respondents, service and support ratings fall well behind its product army. In the midrange, software support continues to be the largest source of dissatisfaction among users planning a switch to another vendor. Even here though, IBM has improved consistently in the past three years. The percentage of sites that mentioned software support among their reasons for considering a change this year has dropped by half from 1986.

IBM Loses PC Ground

Compaq, Apple and Pc Clones Gain On IBM

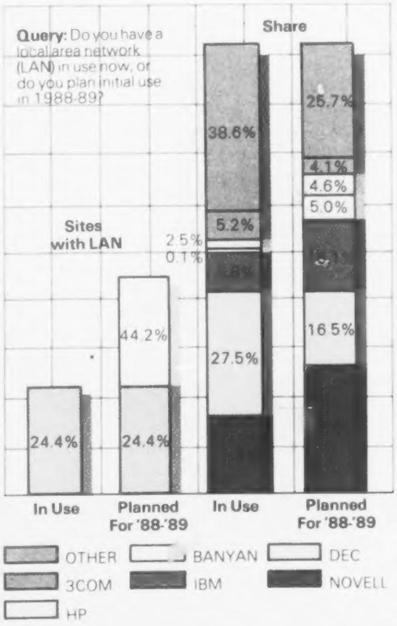


*Mainly IBM PC clones, but specifically in 1988 includes PC's Limited 3.0%, HP 2.1%, AT&T 1.4%, Unisys 1.4%, Leading Edge 1.2%, Tandy 1.0%, Wang 1.0%, etc.

Source: DATAMATION/Cowen & Co.

Network Demand Is High

Novell, IBM, and Banyan Capture LAN Share



*Implicit 49% compound growth rate 7/88-12/89

Source: DATAMATION/Cowen & Co.

The DATAMATION Dozen

The Roster of the hottest minicomputers, past and future, shows some machines maintaining their clout, others sliding into oblivion.

The past	The future
IBM System/36	IBM AS/400, Unspecified
DEC MicroVAX II	DEC MicroVAX, Unspecified
DEC MicroVAX, Unspecified	DEC MicroVAX II
IBM System/38	DEC VAX, Unspecified
IBM PS/2-Model 80	IBM System/36
DEC VAX 8500/8530	HP 3000 Series, Unspecified
HP 3000 Series, Unspecified	IBM 9370, Unspecified
IBM 9370, Unspecified	IBM PS/2-Model 70
DEC VAX, Unspecified	HP Spectrum, 3000 950
AT&T 3B2	DEC MicroVAX 2000
Compaq 386, Unspecified	IBM RT PC
HP 3000 Model 70	DEC VAX 6210

*including workstations

among IBM users, where DOS still prevails with 55.8% of mentions, is OS/2 gaining any ground. The newer PC operating system is preferred by 39% of IBM users, a slight gain from a year ago.

According to the survey, those respondents selecting OS/2 and its extended edition version are more likely to work at larger corporations. So, while IBM is losing market share among respondent sites overall, there is evidence to show that the giant's hold on those larger-volume PC buyers isn't slipping as much as might be assumed. For example, IBM's share of expected unit purchases among survey respondents has, at 39%, changed little. Unit share is declining but not as much as the growing number of sites not purchasing IBM PCs. In all, respondents plan to purchase 124,780 PCs through June 1989, down from 150,435 units between July 1987 and June 1988.

One reason for the difference may lie with PC purchases made directly from the manufacturer. While the propensity to use retail stores for PC purchases is accelerating, the volume that's moving via retail is not increasing equivalently. Hardware purchases made direct from the manufacturer account for half or better of all respondents' unit purchases, a ratio that has held since at least 1985.

PS/2 Hasn't Stemmed Defections from IBM

Given IBM's market share problems, the company's actions in the past year to accelerate PS/2 unveilings have not proved adequate to stem the defections. The model for the PC industry continues to be Compaq Computer Corp., Houston, which has rapidly boosted its Intel 80386-based offerings. Within the survey group, 80386 units make up nearly 40% of Compaqs to be purchased in coming months. The number could well be substantially higher because a sizable portion of respondents did not specify the individual models to be purchased.

Apple Computer Inc.'s share of installed PCs among respondents was flat in the last survey period. Despite the overall PC decline, Apple ekes out a slight increase among purchases through 1989. The latest

Charts by Catherine Francis

survey also shows that Apple users rate the software quality and availability for their systems on a par with IBM and compatible users' ratings.

Local area networks (LANs), integrated office systems, relational databases, and on-line transaction processing similarly rank as high-priority items in this year's survey. But where workstations and PCs have been far and away the beneficiaries of the move away from the minicomputer, this year's projected PC shipment decline suggests that there are alternative scenarios.

For instance, the percentage of sites initially installing LANs is rising sharply. Where about 25% of respondent sites reported use of a LAN this year, that is expected to grow to a projected 44% by June 1989. Moreover, the number of PCs attached to networks is approaching a quarter of all PCs installed, according to survey results. Respondents reported that some 23.6% of their installed PCs are linked via networks—a substantial increase from last year's 18.3%.

The interest in networking PCs is reflected by the vendors that respondents favor for new LAN purchases. The four leaders are Novell Inc. (Provo, Utah), DEC, IBM, and Banyan Systems Inc., Westboro, Mass. Novell looks to edge out DEC, which holds 27.5% of the survey group's existing LAN installations, for the number one position this year in terms of planned installations. Novell's recent unveiling of minicomputer versions of its NetWare network operating software have enhanced its already strong PC networking reputation.

The growth patterns established a year ago for database and integrated office systems software continues in the latest survey. Last year's database growth leader, Oracle Corp., again leads the independent DBMS software vendors with an estimated 22% of planned purchases this year. IBM, which provided office software on a test basis with initial AS/400 sales, also gains significant market share in office systems and databases. A relational database is incorporated into the AS/400 OS.

For DEC overall, the signs are mixed. The company continues to gain new office systems and network installations but loses market share in each, according to survey results. And while its favorability rating increases among its own users, DEC takes a sudden turn for the worse in another important indicator of customer loyalty. After three consecutive years of improved favorability ratings, its ranking for customer loyalty this year is now only slightly better than the industry average. Among oems and systems houses, where dissatisfaction over discount policies lingers, a

Some Hot 386s

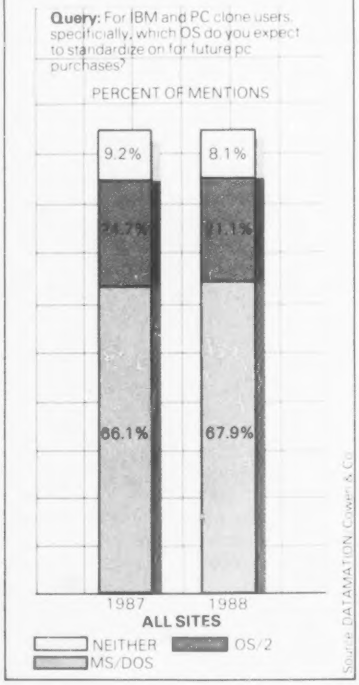
Specific 386 machines purchased/planned

Machine	Purchases 1/87-6/88 Units	Purchases 1/87-6/88 Sites	Expected Purchases 7/88-12/39 Units	Expected Purchases 7/88-12/39 Sites
Compaq				
Deskpro 386	781	175	978	144
Deskpro 386-20	156	48	164	23
Deskpro 386-25	6	4	62	15
IBM				
PS/2-70	69	22	1,461	79
PS/2-80	831	154	1,600	134
PC's Limited (Dell)				
366 16	73	14	120	19
Wyse				
PC 386	54	20	84	12
Zenith				
Z-386	73	20	288	19

Source: DATAMATION/Cowen & Co.

DOS Stronger Than Ever

Only Two out of 10 Users Plan To Switch to OS/2



Query: For IBM and PC clone users, specificially, which OS do you expect to standardize on for future pc purchases?

Source: DATAMATION/Cowen & Co.

Survey Methodology

Results of the 12th annual DATAMATION/Cowen & Co. mini/micro computer survey are culled from the responses of DATAMATION readers throughout the United States. The respondent audience is selected based on their acknowledged purchase or use of minicomputers, small business systems, or microcomputers.

Cowen & Co., a Boston brokerage firm that has directed the survey since 1976, mailed 55,000 questionnaires beginning the week of July 11, 1988. Those questionnaires were directed to no more than three individuals at a single site; final selection of recipients was based on the subscriber's title. The qualified and unduplicated replies that were received totaled 5,257—a return of 9.7%. Results were presented to Cowen's institutional investor clients on Sept. 26.

For the purposes of the survey, the definition of minicomputers covers a broad category of systems, including 16-bit to 32-bit processors (such as the Digital Equipment Corp. PDP-11, MicroVAX, and VAX 8XXX and comparable systems from IBM, Data General Corp., Hewlett-Packard Co., Tandem Computers Inc., and others); minisupercomputers; departmental and small business systems; office systems; network servers; and workstations. The latter are defined as single- or multi-user systems priced generally in excess of $5,000 per station. Personal computers are single-user, desktop, or portable systems priced in general below $5,000 and include the IBM PC and PS/2 models 25-60, Compaq, and Apple II and Macintosh, among others.

This year's projected 5% decline in PC unit shipments and the related 10% dollar value increase are calculated including purchases of IBM PS/2 models 60 and 70 and comparable Intel 80386-based systems. Those computers, in all other instances, are counted as workstations. To order the complete survey results, please call Laraine Donisi at (212) 463-6893.

third now say they expect or are seriously considering dropping DEC as their primary mini supplier.

DEC's proprietary architecture was the second-highest cause of dissatisfaction cited by those DEC users contemplating a switch to another vendor. Complaints about DEC's software support—the leading source of complaints against most other mini vendors—have dropped sharply, however. DEC's post-survey release of a RISC architecture workstation should quell some of the price and architecture discontent. The survey definition of a minicomputer includes workstations (see "Survey Methodology").

Strong Interest in DEC's OLTP Systems

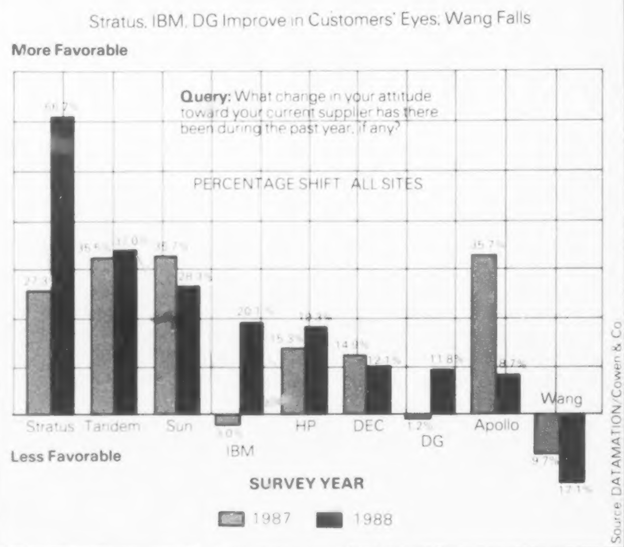
DECtp, the company's freshly released complement of transaction processing products, should produce a substantial boost to the company's OLTP market share, according to survey respondents. For those sites planning new OLTP installations, DEC captures 22.4% of planned installations, second only to IBM's 42.2%. It rates a weak 5.8% market share of currently installed OLTP systems at respondent sites.

In the wake of DEC's entry into the OLTP market, the implications for Tandem Computers Inc. and Stratus Computer Inc. are not uniformly good. Interest in the fault tolerant capabilities the two provide is highest among those planning new OLTP systems. A fifth of respondents planning new OLTP installations say they are willing to pay for fault tolerant capabilities. Tandem and Stratus also record the highest favorability ratings of any vendor.

DEC's RISC/Unix workstation entry may have the same impact in coming months. Respondents to the survey already list Sun Microsystems Inc. and Apollo Computer Inc., the two biggest workstation makers, as offering the largest off-list pricing. DEC's discount practices have not strayed far from the industry average in recent years but could change as a result of its RISC unveiling.

The new Unix-based workstation cuts both ways: it frees DEC to price more aggressively against Sun and Apollo, and potentially less so in its proprietary MicroVAX line. In fact, while the MicroVAX family is increasingly favored for new applications, respondents' planned purchases will represent a smaller percentage of VAX outlays than a year ago.

Attitudes Shift



Source: DATAMATION/Cowen & Co.

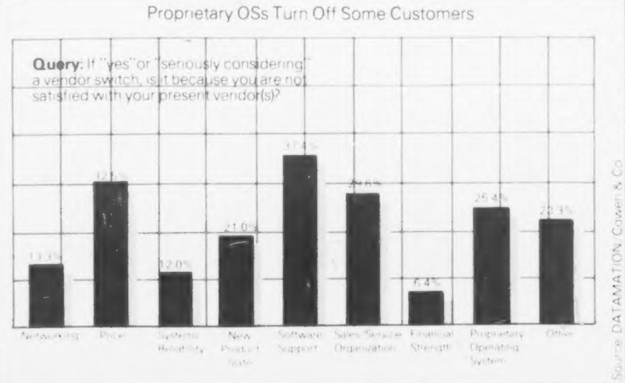
Among all mini vendors, Unix operating systems continue to make slight inroads among commercial users and steady gains in the technical arena. Overall, one fifth of respondents say they are likely to employ Unix for future applications work. Excluding IBM sites, where Unix is not supported on the AS/400, those likely to employ Unix is one quarter of the total.

The Issue of Proprietary Architectures

The traditional minicomputer vendors, for whom Unix typically is an added thrust, suffer the brunt of the minicomputer decline again this year. Falling market shares for Data General Corp., Prime Computer Inc., Tandem, and Wang Laboratories Inc. show up in respondents' planned minicomputer purchases, according to survey results. Importantly, proprietary architecture ranks as a significant issue among those considering a switch. Hewlett-Packard Co., whose Unix-based HP 3000 8XX minicomputers make up an ever-increasing portion of its sales, and Sun Microsystems again gain share of respondents' planned purchases. This year, Unisys will increase its market share through a pair of large government procurements for Unix-based systems.

One of the mini makers whose perception among users fell sharply in past years has made significant progress in redeeming itself. Among this year's survey respondents, Data General garners the first positive favorability ratings among both oems and end users in three years.

Why Users Switch



Source: DATAMATION/Cowen & Co.

Portables Get Raves On The Road

Portable computer sales are soaring. More than a million will be shipped in 1988. Meanwhile, the mighty midgets are remaking the sales and accounting businesses, and work is following executives to their homes and hideaways.

BY MARK HALPER

Nearly one million portables—from laptops to luggables—will be shipped in 1988, according to International Data Corp. The Framingham, Mass.-based company says this is up from last year's 740,000, and more than double 1986's 411,000. Moreover, applications for such itinerate circuitry seem unbounded, and include the tracking of corn niblets, multiple vitamins, frozen fish, dead moose, gasoline supplies and prices, corporate profit and loss statements, and Alka Seltzer.

The two broad categories of use are sales force automation—which gives on-the-road muffler and Twinkie salespeople access to inventory, price, and customer information stored on a distant mainframe—and off-site auditing and accounting. In the latter group, for instance, the Internal Revenue Service has armed its examiners with 18,000 Zenith laptops.

For sales automation, laptops are particularly popular with traveling consumer goods salespeople, who traditionally have hauled volumes of loose-leaf binders and spiral notebooks to keep them abreast of vital statistics. Laptops not only lighten their travel load, they offer them up-to-the-mainframe-minute information while they're out in the field.

"Many of our users are account executives who are on the road all the time and work out of their homes," notes Terry L. Marksberry, who is director of management systems for Pillsbury Co., Minneapolis. Pillsbury's consumer food operation is issuing Zenith Supersport 286 laptop computers to help salespeople stock supermarkets with flour, cake and cookie mixes, frozen foods, and canned vegetables. About half of the 300 computers are in use, says Marksberry, and the other half will be distributed by the end of next year.

The company is setting up X.25 transmission to tie the laptops into a Novell Ethernet local area network in Minneapolis, which in turn is connected via 3270 gateways to an IBM 3090 mainframe, Marksberry says. The system will allow the user to download customer and product information from the 3090, and, using a Higgins Administrative System program resident in the LAN, to communicate via electronic mail with other portable and desktop computers.

Illustration by Cathy Saska

Miles Laboratories' consumer health care division has, for the last 10 months, equipped about 25 sales executives in Chicago, New York, and Philadelphia with NEC laptop computers. It plans eventually to have 100 units in circulation to help it sell multiple vitamins and Alka Seltzer to drug store chains, mass merchandisers, food stores, and other outlets. The division is also serving as a test for other Miles divisions. "We wanted to put technology out there to provide our salespeople with better information," notes Fred Randazzo, manager of sales training.

The company started with the 720KB dual-floppy Multi Speed model, and switched to the 20MB hard disk version out of speed and capacity concerns, Randazzo says. Sales officials use a sales communication program, developed by the company's MIS department to include electronic mail, a customer file, a sales progress report, order status information, and a form for reporting the salesperson's assessment of a sales call. Data are called down from an IBM 3081 mainframe and routed through a DEC MicroVAX II. Spreadsheet and word processing programs are also loaded. Software occupies a little over 2MB of the 20MB hard disk, says Randazzo.

Portables are also playing a key role for companies that are selling information and that need to showcase their databases and downloading capabilities to potential customers.

Laptops, Transportables in the U.S., Past & Future

Laptop and portable computer sales are being driven by the automation of sales forces and accountancies.

	1985	1986	1987	1988
IBM compatibles	80,000	140,000	400,000	600,000
Growth rate (%)		75.0	186.0	50.0
Other portables	72,000	120,000	218,000	190,000
Growth rate (%)		66.7	81.7	-12.8
Subtotal portables	152,000	260,000	618,000	790,000
Transportable pcs	245,175	151,600	122,000	148,000
Growth rate (%)		-38.2	-19.5	21.3
Total: portables & transportables	397,175	411,600	740,000	938,000
All business pcs	2,690,000	3,402,000	5,227,000	6,300,000
% portable & transportable	14.8	12.1	14.2	14.9

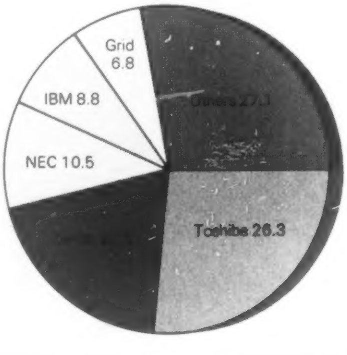
Source: International Data Corp., Framingham, Mass.

Dun & Bradstreet Credit Services, Murray Hill, N.J., or example, has supplied its sales and sales support staff with some 200 Compaq portables. In 1985, it introduced the 8086-based model, and has purchased each of the subsequent 80286 and 80386 units, according to Ernie Harris, vp of electronic delivery systems.

Who Shipped IBM-Compatible Portables in 1987

"Other" manufacturers dominated U.S. shipments of IBM-compatible portables.

BY PERCENT



Source: International Data Corp., Framingham, Mass.

Chart by Catherine Francis

The machines are used to persuade customers to buy telecommunications software from D&B that would allow them on-line and on-board access to the constantly updated D&B database, which resides on an IBM 3090 mainframe.

D&B salespeople also use the Compaq to demonstrate disk-based company profiles with bimonthly updates, and a CD ROM version of D&B's business reference directory, which in hardcopy "is about as big as four New York City phone books," Harris says.

Machine configurations vary and depend to some extent on when they were bought. They are generally equipped with hard disk drives, either 10MB or 20MB, a disk drive ranging from 360KB to 1.2MB, and a 1,200-baud Hayes or Hayes-compatible modem. The 3090 links are made in TTY mode.

Compaq is also the brand of choice for auditing and accounting giant Price Waterhouse, which uses an estimated 2,500 units to download information to its nomadic number crunchers at offsite locations.

"Much of the work time is spent at the client's site, and we move frequently from one to another," notes Don Smith, a Chicago partner, and chairman of the company's steering committee on microcomputer use. "We can spend as little as a couple of hours at some jobs. At others, like Exxon or Mobile, we're there year-round."

A typical configuration at a client's site is 640KB of RAM and a 20MB hard disk drive. About 5MB of the 20MB are occupied by internally developed and loaded programs such as tax and audit forms and formulas, financial schedules, and memo writing, he says.

"Downloading can be a substantial problem because of the lack of uniformity in the infinite variety of minis and mainframes our clients use," Smith notes. The company asks clients to copy needed files onto magnetic tape, which Price Waterhouse then processes through a reader in Chicago for downloading to the appropriate Compaq computer. The procedure, continues Smith, also helps address security concerns among clients who are able to deliver pertinent files without opening entire databases.

The company has been buying Compaqs since 1982 and, like D&B, buys new models as they come out. As more powerful machines are brought in, older models are kept for word processsing and other "lower utilization" functions. Smith says Price Waterhouse has also retrofitted many of its earlier Compaqs with memory expansion boards and microprocessor accelerators.

While laptops and luggables raise the standard of efficiency for salespeople and auditors they may also spell bad news for some workers, like middle managers looking forward to next month's resort area seminar as an escape from office rigors.

With the communications capabilities of most portable units, executives on the road can—and are expected to—send and receive mail, file memos, and tend to other tasks that previously required on-site presence. "It used to be if a guy went to a conference for a week, the office would say, 'Oh, Fred's out until Monday.' Laptops have changed the way people do business," asserts Chris Broome, senior technical consultant for Arco Products Co., Los Angeles, the oil refining marketing segment of Atlantic Richfield Co.

About 60 Arco officials, described by

A Compendium of Top Portable Computing Vendors

Blue Chip Electronics
7305 W. Boston St.
Chandler, AZ 85226
(602) 961-1485
Master PC Portable
Circle **150**

Compaq Computer Corp.
20555 FM 149
Houston, TX 77070
(713) 370-0670
Compaq Portable II; III; and 386 luggables
Circle **151**

CTXT Systems Inc.
9205 Alabama Ave.
Chatsworth, CA 91311
(818) 341-4227
LTP-7 luggable
Circle **152**

Data General Corp.
4400 Computer Dr.
Westboro, MA 01580
(617) 366-8911
DG One/Model 2T laptop
Circle **153**

Datavue
One Meca Way
Norcross, GA 30093
(404) 564-5555
Snap 1+1 and Spark laptops; DV25 luggable
Circle **154**

Dynamac Computer
14001 E. Iliff Ave., Suite 410
Aurora, CO 80014
(303) 695-7780
Dynamac SE laptop
Circle **155**

Epson America Inc.
2780 Lomita Blvd.
Torrance, CA 90505
(800) 421-5426
Equity LT laptop; HX 20; and HX 40 laptops
Circle **156**

Hewlett-Packard Co.
Customer Information Center
19310 Pruneridge Ave.
Cupertino, CA 95014
(800) 752-0900
Portable Plus and Portable Vectra CS luggables; will soon offer custom version of Zenith SupersPort laptop
Circle **157**

IBM
155 Chestnut Ridge Rd.
Montvale, NJ 07645
(201) 930-5000
PC Convertible laptop
Circle **158**

International Systems Marketing
943A Russell Ave.
Gaithersburg, MD 20879
(301) 670-1813
Express-286 and Express-386 luggables
Circle **159**

Jonos International Corp.
930 South Placentia Ave., Suite A
Placentia, CA 92670
(714) 630-2771
C2100 luggable
Circle 160

Kaypro Corp.
533 Stevens Ave.
Solana Beach, CA 92075
(800) 542-9776
2000+ and 2020 laptops
Circle **161**

Micro Express
2114 South Grand Ave.
Santa Ana, CA 92705
(800) 642-7621
The Roadrunner luggable
Circle **162**

Mini-Micro Business Systems
P.O. Box 13063
Boulder, CO 80308
(303) 444-3746
Models 286 and 386 luggables; resells ExecuMate laptops made by U.S. Micro Engineering
Circle **163**

Mitsubishi Electronics America Inc.
991 Knox St.
Torrance, CA 90502
(213) 515-3993
Big Screen Desktop/Laptop laptop
Circle **164**

NEC Home Electronics
1255 Michael Dr.
Wood Dale, IL 60101
(312) 860-9500
Multispeed HD and EL laptops
Circle **165**

Ogivar Technologies
7200 Trans Canada Hwy.
St. Laurent, Quebec
H4T 1A3, Canada
(800) 361-3694
286 Laptop
Circle 166

Sharp Electronics Corp.
Systems Div.
Sharp Plaza
Mahwah, NJ 07403
(201) 529-8200
Models 4600 and 5541 laptops
Circle **167**

Tandy Corp.
1700 One Tandy Center
Fort Worth, TX 76102
(817) 390-3700
Models 1400 and 100 laptops. Also owns Grid Systems Corp., which offers Series 1500 laptops; GridLite Plus laptop; GridCase EXP laptop; GridCase Tempest (for military use). Phone: (800) 200-GRID
Circle **168**

Toshiba America Inc.
9740 Irvine Blvd.
Irvine, CA 92718
(714) 583-3000
T5100, T3200, T3100 series; T1200, T1000
Circle **169**

Trans PC System Inc.
11849 E. Firestone Blvd.
Norwalk, CA 90650
(213) 868-6930
LT laptops; LC luggable series, crt luggable; GP luggable
Circle **170**

U.S. Micro Engineering
P.O. Box 17728
Boulder, CO 80308
(303) 529-8200
Models 286 and 386 ExecuMate laptops
Circle **171**

Zenith Data Systems
1000 Milwaukee Ave.
Glenview, IL 60025
(312) 391-7000
SupersPort 286 laptop
Circle **172**

Broome as "normal office workers," use Toshiba 1100, 1200, and 3100 laptop computers "to do work while they're away on business trips," typically using 1MB of on-board RAM and a 20MB hard disk drive.

Broome says the most common use for these laptops is dialing IBM's PROFS office automation software, which resides on a host 3090 at Arco's Los Angeles headquarters. PROFS connectivity permits portable users to transmit electronic mail, check their calendars and those of others in the system, and schedule meetings. Among other tasks, PROFS also allows users to send documents to printers at other sites provided they are on the same IBM SNA network.

Meanwhile, north of the border, it was a seemingly eager bunch of workers that prompted the city of Montreal to purchase 20 Ogivar 80286-based laptop computers, each equipped with 20MB hard disk, 720KB floppy disk, and 1MB of on-board RAM. "Our [desktop] users mentioned that if they had portable PCs, they could do more work at home," says IS director Claude Couture.

The city bought the machines from Montreal-based Ogivar in June, loaded them with Wordperfect, Lotus 1-2-3, DBase III, and DataEase, and distributed them throughout 20 departments. It will equip them with mainframe connectivity after it "installs a good security system with multiple level passwords," Couture says. Desktop-to-mainframe connections

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are made via dedicated lines. "The central data include city land use plans. If somebody was able to figure out how to get hold of it, it could generate land speculation and this sort of thing," Couture notes.

Another governmental agency in Canada, the Ontario Ministry of Natural Resources, is using a Compaq Model II for both tracking and increasing its moose population, according to John Barbowski, information data systems coordinator.

One problem even more endemic with portables than with desktop computers is theft. It's not difficult to slip off with a 10-inch by 12-inch by 2-inch piece of plastic. Sohio Oil Co., the Cleveland-based gasoline retail arm of BP America, has taken a precautionary measure by preventing some 1,400 Tandy model 100 and 102 laptops from printing or running anything but proprietary programs downloaded into bubble RAM from one of 10 DEC MicroVAX IIs.

☐ LAPTOPS ALLOW EXECUTIVES TO DO THINGS THAT PREVIOUSLY REQUIRED ON-SITE PRESENCE.

The company has issued one 128KB machine to each of its 1,400 service stations in the eastern U.S., for daily reports on sales and competitors' prices, according to Bryant Santini, manager of retail automation. (Sohio runs service stations under its own name as well as Gulf, Boron, Gibbs, and Gas & Co.) The Tandy-to-DEC transmissions are made in two-minute sessions via standard telephone point-to-point communications, although Santini says Sohio is considering establishing leased-line services for stations with long distance connections to a VAX. The regional VAXs route the daily information to either a Prime Computer Inc. or Hewlett-Packard mini in Cleveland.

While Sohio presently loads the programs into bubble memory, it is considering buying new replacement machines equipped with less-expensive static RAM for the same purposes, says Santini. To protect the machines from motor oil and other physical rigors of gas station wear and tear, Sohio shelf-mounts them and covers the keys with plastic. "There are a lot of gorillas out there banging on them," he quips.

Mark Halper is a freelance writer based in New York City.

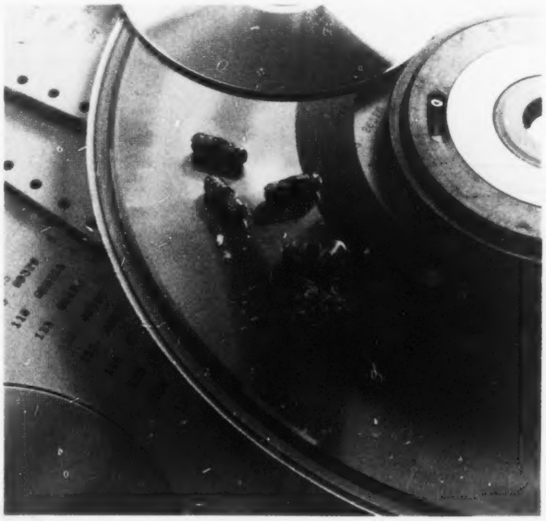
Top Drug Firms to Digitize Documentation

The biggest pharmaceutical firms have recognized the value of digital document processing systems in reducing their R&D cycles and FDA approval time. Could it speed new drugs into the hands of the sick?

BY SCOTT C. McCREADY

Fifteen of the top 25 pharmaceutical companies are poised to spend $23 million dollars over the next 18 to 24 months on the relatively new technology of digital document systems, according to recent research conducted by CAP International Inc., Norwell, Mass.

ICI Pharmaceuticals (Wilmington, Del.), Warner Lambert (Morris Plains, N.J.), Glaxo (Research Triangle Park, N.C.), and Pfizer (New York), have already taken the plunge. While the other 11 firms asked not to be identified for competitive reasons, they will all have optical storage-based document systems by the end of the year, at an average cost of over $1 million. The remaining 10 have committed to spending $17 million over the same period.



Photograph by Bob Lorenz

There are approximately 156 drug companies in the U.S., many of which are trying to speed the manufacture of new drugs by computerizing the new drug application (NDA) process with standard technologies (see "IS: the Best Medicine for Drug Monitoring," Aug. 1, p. 41).

What is it about optical-based document processing systems that is prompting the major pharmaceutical companies to assign it a large portion of their office automation budgets? They have discovered that digitizing document images and processing them electronically offers the greatest potential for shortening the R&D cycle, the time required for Food and Drug Administration (FDA) approval, improving the effectiveness of label design and approval, and minimizing other administration expenses.

"Senior management is finally beginning to wake up. We process documents. That is the essence of this business. Because of the long R&D cycle and the strict regulatory environment, we need every tool available to improve the process and protect the integrity of our files," says a spokesperson for Ciba-Geigy, which is evaluating systems.

"This technology appears to be readily adaptable to the R&D environment," says David H. McCurdy, former ICI director of pharmaceutical research administration and an internal pioneer of its system, now a consultant to the firm. ICI Pharmaceuticals began investigating the use of electronic documentation as far back as 1984 and, after determining its existing costs of managing documentation, became the first pharmaceutical firm to employ optical disk technology with a pilot FileNet Corp. system in January 1986.

A spokesperson for Warner Lambert says, "This is the first technology in perhaps 20 years that will allow us to alter the basis of competition within this industry. Internal efficiencies stand to save us millions of dollars, while the impact on the FDA could amount to hundreds of millions."

Pharmaceutical firms, however, face a particularly cumbersome, paper-intensive process of bringing a new drug to market, a process that can take up to 10 years and $125 million to complete. Their health in the highly competitive industry is related entirely to their ability to innovate continually and bring those innovations to market first. Therefore, any investment in a technology—in this case, optical disk systems—that offers the potential to reduce radically the mountains of paper-based drug research information required by the FDA, while simultaneously offering significant economies for the R&D cycle, is money well spent.

The industry as a whole will spend in excess of $5 billion on R&D this year, but the average product will still take eight years to complete the cycle unless the means for accomplishing the process can be altered radically.

Both phases of the drug approval process, as they are conducted today, present overwhelming document processing problems. During the exhaustive clinical testing required by the FDA of any new drug, pharmaceutical firms have to manage not only internal R&D but a great deal of research that is performed, of neccessity, by organizations outside the firm's control. It is not unusual for a pharmaceutical company to receive 600,000 case report forms per year from outside testing parties. Since these records are the "go or no go" evidence for the FDA to approve the drug, it is imperative that any incomplete case reports or patient records be clarified completely before being shipped to FDA evaluators. Today, clarifying the often incomplete case reports is done in batches, which usually are too large to be handled by phone and must be mailed back and forth between the pharmaceutical firm and the clinical testing site.

How to speed up the process of clarification? One answer: digitize the incoming documents and electronically route the report form to the appropriate department for review. Should further clarification be needed, those forms can be downloaded overnight to the appropriate testing center. The clarification process can then be conducted by telephone and annotations made to the document in real time. This is no small investment on the part of the pharmaceutical manufacturer, but the potential financial return is relatively easy to discern.

In the second phase of the drug approval process, the FDA requires that each pharmaceutical company deliver the clinical test results to the agency in a strictly regulated format for evaluation by an assortment of physicians and medical experts. The net result is that the pharmaceutical company has to create new documentation that compiles and tabulates the statistical information contained in the case reports. The statistics must be classified to clearly show whether the drug caused any adverse reactions or reacted with other medications, and its overall effectiveness.

Since 1962, NDAs have been submitted on paper as the law requires, commonly delivered by tractor trailer. While the paper method of document presentation has yielded a remarkable level of safety for the U.S. population, the price it exacts is twofold: the great cost, which is eventually passed onto the consumer, and the lengthy approval process.

Using paper slows the process, not only because of the huge volume of documents involved, but also because paper documents do not allow simultaneous access by multiple users. Therefore, should an FDA inspector require a piece of unavailable documentation to continue an evaluation, he or she simply will go on to another NDA. The volume of documentation precludes the FDA from handling multiple copies were they even available.

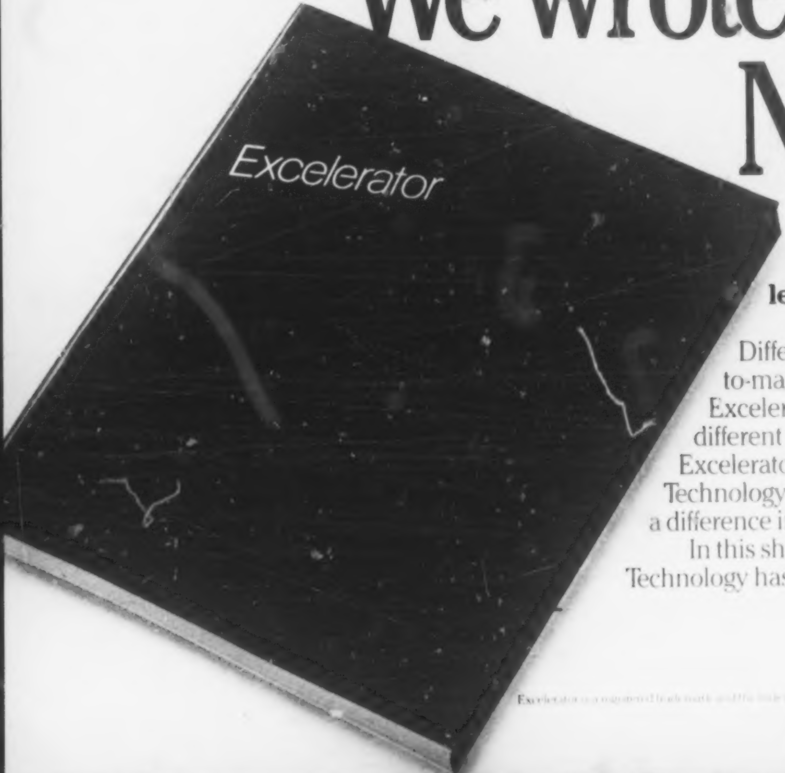
CONSULTANT McCURDY: Began looking at electronic documentation for ICI in 1984

Photograph by Sal DiMarco/Backstar

Furthermore, should an inspector require clarification, the entire process must be conducted by mail to provide a record of the change for legal protection.

The FDA approval process is not likely to improve by streamlining the documentation itself. In fact, though the FDA, for the first time in its history, rewrote the requirements for drug filings over the past

We wrote the book
Now we've



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three years, the table "New Technology Hasn't Helped Yet" shows this has not shortened the approval cycle.

Submitting NDA documentation via optical storage media is the most obvious solution to ultimately eliminating the paper glut, since one 12-inch optical disk can store approximately 50,000 pages. Unfortunately, until the law that requires NDA documentation on paper is changed, the drug companies will have to back up any optical disk-based NDAs with paper. The FDA has said it intends to change the law, though that could take years.

Using optical storage technology for NDAs would also allow immediate, multiple access to the same document and provide the benefits of on-line indexing techniques. Clarification requests would no longer have to be handled by mail, since sending images over telecommunications lines overnight is reasonably economical—if they are relatively few in number.

"The ability to rapidly introduce [this] technology to large paper-based files has been found to be possible, and integration into a computer-based information system is proven to be practical and readily implemented," says ICI's McCardy. In June 1988, ICI was the first company to submit an optical NDA to the FDA. That NDA was backed up with paper documentation.

Once a drug has been approved, there is a step that represents another potential application for digital document systems: the design of an appropriate label and directions. To a greater degree than in the consumer products world, pharmaceutical companies have to be concerned about accuracy and safety in labeling.

The design of an appropriate label can become a nightmare of coordination to ensure that everyone is working with the latest version, and get the appropriate level of approval. The process can be streamlined and accelerated by digitizing the original draft and electronically routing it to the right people, along with the appropriate deadlines for changes and final approval. As with many applications for optical document systems, the net economic benefits are usually derived from being able to move the image around the office electronically and enforce discipline on the business system via work flow software.

Marketing & Legal

The introduction of any new technology always raises the issue of which departments should be able to access it and, perhaps, thereby contribute unforeseen benefits to the entire organization. Pharmaceutical companies could benefit by extending the system to the marketing and legal departments.

Marketing may be more of a hands-off proposition in the pharmaceutical industry than, for example, it is in the automobile industry, where marketing tends to set product direction and development.

Marketing's potential to contribute to the R&D process was demonstrated in the case of a pharmaceutical company that was developing a drug to control high blood pressure. The drug was successful in its primary goal, but marketing personnel noticed that it also caused weight loss. Therefore the drug had a potential secondary market that was missed by the origi-

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nal development team, but which could have provided a lucrative potential revenue stream sooner than it did.

Because the potential legal liability incurred by the introduction of a new drug is large, the legal staff must also be able to have access to R&D information to try to anticipate problems related to safety or effectiveness.

If optical document systems offer such improvements in the drug manufacturing process, given the hundreds of millions of dollars at stake, why aren't all pharmaceutical companies clamoring to have systems in place? Several issues have to be resolved prior to the optical NDA becoming a full-blown reality: FDA funding, system standards, and man's inevitable preference for homeostasis.

Technology Hasn't Helped Yet

The average time required to get a drug approved has not shortened, although the worst-case situation has improved.

	1983	1984	1985	1986	1987
New Drug Applications	94	142	100	98	68
Average Approval Time*	14.7	18.7	22.1	21.6	27.0
Best Case	.9	1.5	2.6	1.2	2.9
Worst Case	93.3	131.3	121.0	127.5	87.3

Source: FDA, 1988

Approval times are measured in number of months.

FDA Funding

Despite special congressional budget approval for a separate department to speed up approval of AIDS-related drugs, the FDA is severely underfunded. This year's FDA information systems budget, according to an official there, is "about $3.5 million, with $2.5 million of that scheduled to be spent on hardware, but this represents a figure much higher than the average funds available historically, and it is not certain that next year we will be able to spend as much."

Even if the FDA had the money to invest in digital document systems, a lack of standards makes its selection of a single system difficult. The issue is especially problematic, since the FDA must service the approximately 156 companies in the U.S. actively involved in the drug R&D process. Those pharmaceutical firms will undoubtedly purchase systems that reflect their individual methods of research and development. The dilemma arises in that the FDA cannot afford to invest in incompatible equipment or to train their examiners on a variety of systems.

The same standards problem arises within the pharmaceutical companies themselves. "Standards are an issue," says a Squibb spokesperson, "since there is certainly the need to have interoperability within the corporation, but we don't have that now, since departments use a variety of document creation programs and microfilm still remains lacking in the standards arena."

Issues such as file structure and media size standards, which would allow media interchangeability, are problems, but indexing, screen layout, and database query facilities are more pressing problems. In fact, says a high-level spokesman for the FDA Center for Drug Evaluation and Research, in Washington, D.C., "The issue is not media interchangeability. What is vital is a standard software to manipulate the data portion of the image."

One of the biggest problems in setting standards for digital image systems is their conflict with expected advances in the technology. Some of those improvements may include expert system-type logic for the database query facility that would translate queries between multiple vendor environments. A natural language interface to statistical test results would allow researchers and FDA reviewers to recombine data to obtain new statistical findings. Improved scanning technology will allow the data portion of the image to be converted into a form that can be manipulated.

Standards at the physical level, as defined by ISO, are not likely to exist for several years. Still, an advisory body made up of FDA officials, pharmaceutical manufacturers, the vendor community, and pharmaceutical associations could take the first step toward uniformity by separating data standards from image standards, which would pave the way to further progress. This is not an application of technology that can wait to be sorted by standards committees or de facto standards; getting drugs approved quickly involves the welfare of the nation.

Given man's tendency to perpetuate the status quo, it is relatively easy for end users to review digital document systems and decide that the technology is not quite there yet or that the system cannot be cost-justified. Cost-justifying any piece of office automation equipment is a large task since many of the benefits are difficult to quantify. Just ask IS managers to cost-justify upgrading a System/36 to an AS/400.

The cost-justification problem for image systems can be overcome, however, as the Upjohn Co. of Kalamazoo, Mich., has found. "We will have several systems in the near future, but they will have to use our existing workstations in order to keep cost down on a per-user basis," says an Upjohn spokesperson. Before Upjohn can use its pcs as image workstations, however, it will have to equip them with add-in boards to provide upgraded communications, image compression/decompression, and between 2MB and 10MB of extra RAM.

We all talk about technology as a competitive advantage but rarely do we take the time to classify technologies into those that provide a tactical advantage and those that offer a strategic pathway to success in an industry. Image processing is that technology pathway of the '90s.

Some companies have recognized image processing as such. "This is a tightly knit community," says a representative of Hoescht-Celanese, New York, "and optical systems is the most frequently discussed topic at industry gatherings. Everyone is seriously looking at it, but the pharmaceutical industry is traditionally closed to outsiders, therefore no one wants to talk about what they're doing."

The fact is that the pioneers of this technology have a strategic advantage in an industry that has been traditionally reluctant to adopt any new technology. ICI Pharmaceuticals has a two-year lead over Warner Lambert, Glaxo, and Pfizer. The next tier of adopters are another 12 to 18 months behind those three. The question becomes, what further shot in the arm will it take for the rest of the industry to wake up? Or will they continue to behave like a child after a tetanus injection, thinking that, if they just sit on their hands, it won't hurt too much?

Up until now, pharmaceutical firms could have responded that way to a new technology with no ill effect, as success in the industry was predicated solely on the drug R&D and marketing efforts. As the spokesman for Warner Lambert indicates, however, the potential for image processing means that the most successful pharmaceutical companies will be those that take a leadership position in office systems technology.

Scott C. McCready is associate director of the optical disk systems market research group at CAP International, Norwell, Mass.

Street Savvy: Stanley Trades On Execution

"When it comes to computers, Morgan Stanley may not be doing anything that anybody else isn't doing. They're just doing it better," sums up one Wall Street wag. Right now, the $3 billion securities firm is the sweetheart of the Street. Analysts laud the company for its technological savvy.

Says Wall Street watcher Ted Withington, "There's no reason to believe that Morgan Stanley has discovered some kind of technology-tuned crystal ball for making money which no one else has. But by using computers very intelligently and in a disciplined way, you may be able to make better decisions. And there's reason to believe that's what Morgan is doing."

What Morgan does, it does very selectively and secretively. Working on the secret side are Morgan's "rocket scientists," crack economic mathematicians who devised many of the sophisticated trading techniques in play today. Its 700-member IS shop is experimenting with Sun and Apollo workstations, souping up the Unix machines for real-time data analysis in trading applications. While these and similar efforts are characterized as high-risk by the cautious company, they're clearly not in the megamillion dollar range. "There are no $40 million projects going on here," deadpans a Morgan IS employee. "There are a lot of little projects." Little projects that help make big business. "Morgan," says financial consultant Ed Perlin, "is an aggressive shop." ◀

Kansas Bank Pays Bills By Telephone

The Wizard of Oz has nothing on Eldon R. Flory, progressive senior vp of MIS at Capitol Federal S&L in Topeka. Eleven years ago, when most banks were still in the dark ages of automation, futurist Flory devised an electronic bill-paying system—one of the earliest of its kind in the U.S.

The system, updated to run on an IBM 4381 and a PC AT, enables customers' household and personal bills to be automatically deducted from their accounts.

Under the service, where all validation and updating is done on-line, Capitol Federal pays $10.8 million in bills a month, roughly translating into 26,000 checks and 85,000 payments a month. "We're paying three bills on every check," explains Flory, "which means we're collecting three service fees." When postage is deducted, the S&L is hauling in over $350,000 a year—a tidy sum for a bank that launched the service on a high-tech hunch over a decade ago.

Capitol Federal in Topeka.

Flory says phone payers, who have average balances of $2,300, become the bank's most loyal customers. By dialing an 800 number on a rotary or Touch-Tone phone, "you can pay every bill that you have—except one. We wouldn't recommend you pay your taxes with it," quips the visionary vp. ◀

INSURANCE INDUSTRY SPENDING IN SOFTWARE AND SERVICES

Delivery Mode	1986 ($M)	1987 ($M)	1988 ($M)	1989 ($M)	1990 ($M)	1991 ($M)	1992 ($M)
Processing/ Network Services							
Remote Comp/ Batch Facility	344	395	450	509	570	638	707
Management	361	397	437	480	528	581	639
Total Processing Services	705	792	887	989	1,098	1,219	1,346
Applications Software							
Mainframe/ Minicomputer	282	335	395	458	527	601	687
Microcomputer	109	147	191	241	294	353	431
Total Applications Software	391	482	586	699	821	954	1,118
Turnkey Systems	179	204	233	263	295	327	360
Professional Services	894	1,054	1,174	1,331	1,544	1,858	2,239
Sector Total	2,169	2,532	2,880	3,282	3,758	4,358	5,063

Source: Input, Mountain View, Calif.

Getting More Experts In Insurance

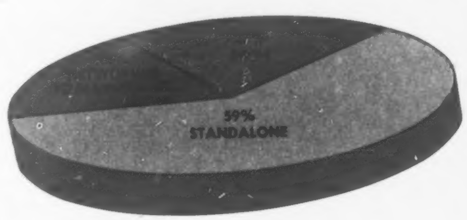
Insurance companies, which avoid risk like the plague, increasingly are calling on expert systems to cover their assets. In 1987, two out of three top 100 U.S. insurance companies were either using, developing, or researching expert systems, according to a Coopers & Lybrand survey.

The Big Eight firm found that underwriting was the biggest application area for artificial intelligence (AI) among large insurers. Marketing/sales support and personal financial planning applications also were of interest to life and health insurers, while claims, investment, and risk/product matching were popular expert systems usages among property and casualty companies.

Investment applications have become even more widespread, according to Coopers & Lybrand's 1988 study of the broader financial services sector, which views the insurance industry as the leader in the AI arena.

Helping substantiate these perceptions are firms such as Fireman's Fund Insurance Co., San Rafael, Calif. Fireman's, which has one of the first commercial expert systems in production (IBM's Expert System Environment). Fireman's has pioneered the use of AI in underwriting. ◀

HOW MINICOMPUTERS ARE USED IN BANKS



Source: American Bankers Assn., Computers in Banking, 1987

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DATAMATION®

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

Industry-by-Industry IS Spending Survey

$32 BILLION

That's How Much Top U.S. Corporations In a Dozen Industries are Investing in Information Systems this Year. But not Every Industry is Keeping Pace. Nor do Companies in the Same Industry Spend Equal Amounts. Is Your Company a Leader or a Laggard??

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DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

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A DATAMATION REPORT Information systems is taking a bigger bite of revenues at the top shops in the U.S. Despite decentralization and off-budget computing, IS's cut has risen to 1.9%. This year, the total of the budgets for information systems at the top 120 companies in 12 industries will be $32 billion. In this report, the data, charts, and overviews for each sector were compiled and written for DATAMATION by the Cahners Business Research Group. The case histories were written by Tom McCusker, DATAMATION's Los Angeles Bureau Manager.

Cover Design by James Montalbano

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Photograph by Marlow/Magnum

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INSIDE DATAMATION

A Question Answered

About a year ago, DATAMATION answered the question, "What percent of revenues is the U.S. corporation budgeting for information systems?" Apparently, it was a question long asked but just as long unanswered. Since that original study was published in September 1987, hardly a day goes by without a phone call to our editorial offices thanking us for finally providing a standard for budgeting comparison.

This year, IS executives at 120 leading U.S. companies—the top 10 companies in a dozen industry sectors—have again been extremely cooperative, giving us even more confidence in the solidity of our findings. Performing the number gathering and crunching, and writing the overviews of IS practices in each sector, was the Business Research Group (BRG), a Boston-based division of Cahners Publishing, owners and publishers of DATAMATION. Piloting the project at BRG were Kim Myhre, vice president of research and consulting, and Paris Burstyn, director of telecommunications research and consulting. Myhre is a 10-year veteran in the market research and consulting business, and his articles on the network industry have appeared in numerous industry and business publications. He has worked with International Data Corp., Harvard University, Contract Research Corp., and Energy Information Inc., and has degrees from Rutgers University and Boston University. Before joining BRG, Burstyn directed Arthur D. Little Decision Resources' Spectrum Telecommunications market research program and covered the telecommunications and computer industries for *Electronic Business* magazine. He has degrees from Boston University, Rutgers University, and the University of Colorado.

BRG's Kim Myhre (left) and Paris Burstyn.

Buttressing the work of Burstyn, Myhre, and their colleagues at BRG, are a dozen case histories—one for each business sector—reported and written by the veteran computer journalist Tom McCusker. McCusker first joined DATAMATION in 1970, left for a while to work on *Output* and *Software News*, and returned to DATAMATION as Los Angeles Bureau Manager. McCusker began his journalism career in Toronto with the Canadian Press, Canada's wire service. After moving to the States, he pursued business journalism, as an editor of metalworking and electronics magazines and as the writer and broadcaster of a daily business report on Los Angeles radio stations.

Putting all this information together, making it readable, making the data clear, was a team of copy editors, designers, and production specialists. Chief among them were designers Anthony Kosner and James Montalbano, copy editor Estelle Silberman, and production magician Catherine Kennedy. Editorial assistant Karen J. Scher also pitched in, gathering bits and pieces of information that, to readers, may seem to appear almost automatically, but, without which, publication would be impossible.

—Parker Hodges, Managing Editor

DATAMATION

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Industry By Industry IS Survey

IS is taking a bigger bite of revenues at top shops. Despite decentralization and off-budget computing, IS's cut has risen to 1.9%. This year, the total budgets for information systems at the top 120 companies in 12 industries will be $32 billion.

A DATAMATION REPORT

DATAMATION surveyed 120 of the country's largest corporations to determine the value and the nature of their information systems expenditures. The survey of the top 10 firms in 12 industry sectors reveals a healthy aggregate growth among these corporate giants, and a consequent rise in IS budgets. Revenues of this select group grew 8.8% to $1.53 trillion in 1987; profits were up 9.3% to $73.3 billion.

For 1988, DATAMATION projects revenues and profits will grow between 12% and 16% above 1987 figures. But we do not expect overall IS spending to increase as dramatically, owing to the continuing effort by corporations to control costs and improve margins. Still, in 1988, DATAMATION estimates the top 120 companies are spending $32 billion on IS.

Meanwhile, the percentage of revenues spent on information systems budgets in 1987 rose to an average of 1.9%, up from 1986's 1.8%. This translated into an aggregate IS budget of more than $29 billion at these 120 companies last year. Of this, $14 billion went to meet the salaries of IS personnel. Hardware expenditures accounted for the second-largest slice of the pie, totaling $10 billion. Overhead costs accounted for just over $2.5 billion, with software outlays also coming in at the $2.5 billion mark.

Three industry sectors—industrial and automotive, electronics, and banking and finance—dominated all others in the size of their corporate computer budgets. Together, these three accounted for $15.7 billion, or 54% of the aggregate IS budget of the industries we measured. Conversely, the health care and pharmaceuticals, metal and metal products, retail, and transportation sectors as a group consumed just 7.8% of the $29 billion aggregate budget. Still, the $2.3 billion these companies spent is far from inconsequential, and the importance of information systems to their corporate operations is generally greater than their IS budgets might indicate.

As impressive as are the IS budgets at these industry and commerce leaders, the reported figures fall far short of the actual monies spent at most of them companywide. In fact, some individual corporate IS budgets fell in 1987 as a result of decentralization activities. Growing numbers of firms are taking advantage of the power provided by desktop personal computers linked via local area networks to departmental minicomputers. While these, in turn, interface to the corporate mainframes, the departmental equipment may fall outside of the main IS budget.

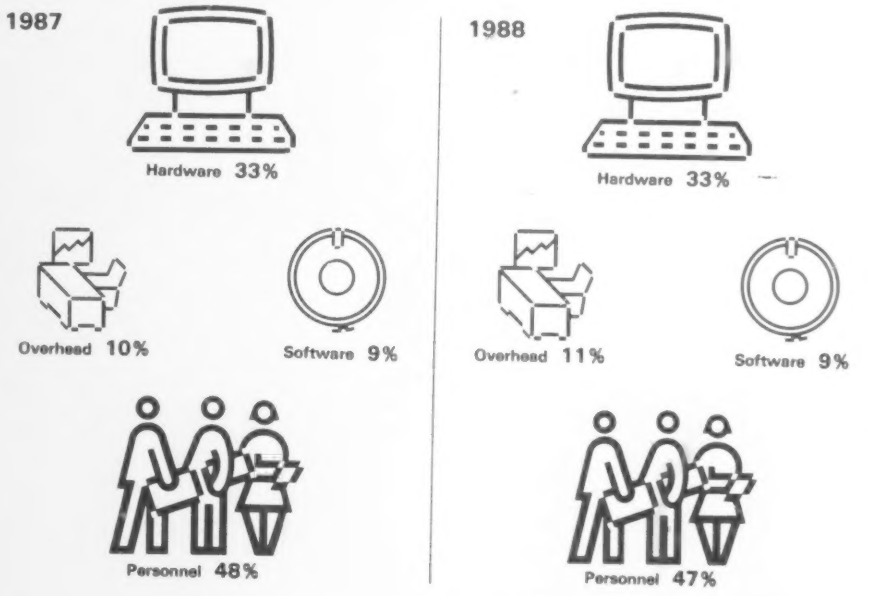
Industry by Industry Budget Summary

INDUSTRY	IS AS % OF REV	IS BUDGET	REVENUE	PROFIT
Banking & Finance	0.5*	$4,512	$902,486*	$(2,263)
Electronics	4.0	5,836	145,909	11,668
Food & Beverage	1.6	1,819	113,675	6,784
Health Care & Pharmaceuticals	1.1	576	52,248	5,004
Industrial & Automotive	2.7	7,748	286,950	12,804
Insurance	2.2	2,653	120,597	6,309
Metal & Metal Products	1.2	622	51,849	1,275
Petroleum & Petrochemicals	1.3	3,842	295,537	5,647
Process Industries	1.7	1,912	112,446	6,272
Retail	0.4	670	167,499	4,768
Transportation	1.3	757	58,210	2,762
Utilities	2.0	2,526	126,278	12,269
Totals	1.9**	33,473***	1,531,198**	73,299

*Assets, rather than revenues, are indicated in the Banking and Finance category.
**Based on revenue and budget totals from all industry sectors other than Banking and Finance.
***Includes the Banking and Finance expenditures.
All dollar amounts are in millions.
Source: Business Research Group

Distribution of IS Funds By Percent

Overall average for all industries



Photograph by Peter Marlow/Magnum

Three industry sectors—industrial and automotive, electronics, and banking and finance—dominated all others in the size of their corporate computer budgets. Together, these three accounted for 54% of the aggregate IS budget.

In a similar fashion, much of the computer-based factory automation equipment and software comes under manufacturing operations budgets at companies that are in the business of producing products. In some instances, the amount spent on computer integrated manufacturing surpasses the computer expenditures for traditional corporate applications such as accounting, employee record-keeping, and payroll generation.

It is also at these top shops that advanced computer technologies first find commercial application. Due to their continued reliance upon in-house programmers to modify off-the-shelf software and to build custom programs, these big IS facilities are a prime market for everything from fourth generation computer languages to full-blown computer aided software engineering systems. The industrial and automotive sector, as well as the electronics industry itself, has an insatiable appetite for computer aided design equipment. And America's largest corporations are providing a solid test bed for expert systems.

In future years, hardware expenditures will continue to lead those for software, although the two will grow closer in value as more flexible off-the-shelf applications programs become available. As canned software expenditures continue to grow, and as computer systems become more modular and easier to operate, personnel costs will decline correspondingly. Meanwhile, the percentage of IS budgets directed at communications products and software is on the upsurge. Falling costs and growing capabilities both in local area networking and in wide area transmission facilites will stimulate strong investment in the communications realm.

IS Survey Methodology

DATAMATION and Business Research Group identified the top 10 companies in each of 12 predetermined industry sectors: Banking & Finance, Electronics, Food & Beverage, Health Care & Pharmaceuticals, Industrial & Automotive, Insurance, Metal & Metal Products, Petroleum & Petrochemicals, Process Industries, Retail, Transportation, and Utilities.

We based the selection on total revenues for 1987 obtained from annual reports and public records. To each company, we sent a letter introducing the DATAMATION Industry by Industry IS Spending Survey and the topics we wanted to discuss. We guaranteed each company individual anonymity to encourage respondents to provide information that some companies view as proprietary. We followed the letter with a telephone survey. At some companies' request, we mailed surveys. We again followed up the mailed survey with a phone survey to achieve the highest possible response rate.

The questionnaires contained two parts: a general section inquiring about the size of the dp/IS department, its responsibilities, its budgets, what the budgets cover, spending trends for 1987 to 1989, the size of the budget and its breakdown regarding hardware, software, personnel, and overhead. An industry-specific section then asked about that sector's average IS spending, where the company viewed its own position regarding its IS spending level, and how the company applied its computers to nonadministrative, production-oriented uses.

Terms are defined as follows:

Hardware comprises all computer gear on the IS budget including data communications. Software pertains to all funds allocated for buying software. Personnel encompasses all employee costs for computing operations and hiring software developers. Overhead includes charges associated with the physical plant, including utilities and rent. Production-oriented applications cover those nonadministrative IS jobs that affect the actual financial performance of the company.

Wherever possible, information included in this report was obtained directly from the companies. If a company did not provide information, or did not provide it in a suitable form, BRG estimated figures, based on investigative reporting and analysis of industry trends.

The comparative data are based on total budget IS expenditures and they do not include off-budget estimates.

Every effort was made to include the most significant computer users in each of the 12 categories. Owing to the size of such a comprehensive survey as this, however, some large IS shops may have been omitted inadvertently from the listings. It should also be noted that, because the size of businesses operating within each sector varies to a great degree from industry to industry, some of the companies that failed to make our roster may in fact be larger users than companies in other sectors that did qualify for inclusion in our listings.

How to Read the Charts

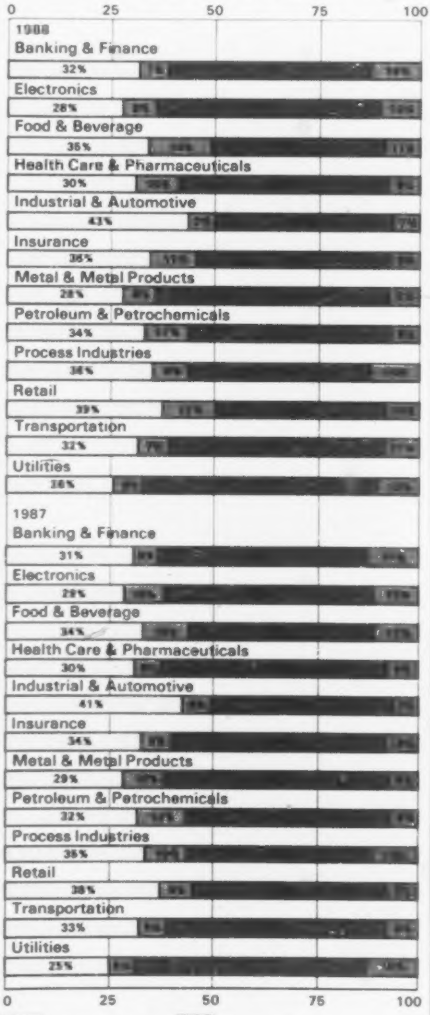
Data in the charts in this introduction reflect aggregate expenditures for the top 10 companies in each industry group.

The table for each sector shows the companies in each group, their computing intensity, their revenues, profits, and their accounting years. (For companies in banking and finance, assets rather than revenues are used.)

The computing intensity icon shows how each company in a group compares to others within that group. An equal sign (=) indicates that a company spends about the same percentage of its revenue on information systems as the mean for its group. A plus sign (+) means that a company spends a significantly larger proportion of its revenue on IS. A minus sign (−) means that a company spends a significantly smaller percentage of its revenue on IS.

How They Spent

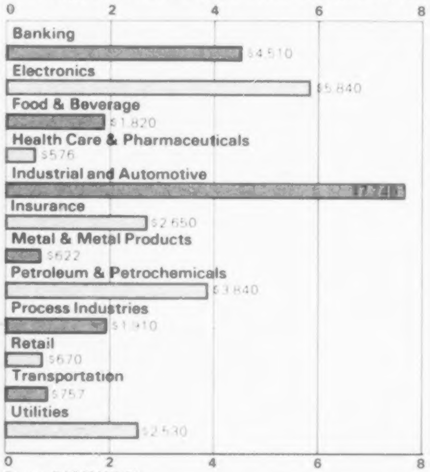
A comparison of the top shop's distribution of their budgets, by percent.



Source: DATAMATION

What They Paid

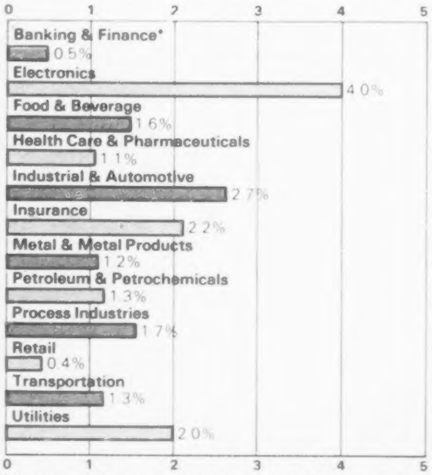
The aggregate IS budgets, in millions of dollars.



Source: DATAMATION

IS's Cut

The top shops' budgets as a percentage of their companies' revenues



*Assets rather than revenues are used in the Banking & Finance category.

Source: DATAMATION

OVERVIEW

Banking on The Best in IS

Even in tough times, the banks buy IS, running their back offices and competing for new customers with computer-based services. A big seller: fault tolerant systems.

Computer and communications systems constitute the backbone of the modern banking industry, and its leaders continue to surpass most other industry sectors in their aggregate expenditures in this area. Since revenue measures in this industry vary widely, the IS budget here has been calculated as a percentage of assets. The top 10 banks devoted 0.5% of their assets to IS in 1987, resulting in information systems expenditures of $4.5 billion on assets of $902 billion. Falling profits among several of the top 10 institutions last year have occasioned some belt-tightening. Giant Citicorp, for example, took losses of $1.1 billion in 1987, and BankAmerica, Manufacturers Hanover, and First Interstate Bancorp also finished the year heavily in the red.

Nevertheless, banks maintain and upgrade their IS facilities even during hard times. Increasingly, they compete for customers with new computer-based services tied to extensive networks of automatic teller machines. Banks are attempting to program the ATMs to be more responsive to individual customers. These services require custom programming, since off-the-shelf software gives no competitive advantage. In 1988, allocations for hardware and software rose relative to personnel and overhead spending.

The acquisition trend evident among the larger banking institutions is also placing growing demands upon IS personnel and equipment. Efficiently assimilating another bank's computer and communications operations into the parent company's puts a huge strain on the corporate IS department.

In their behind-the-scenes ~~transaction~~ processing, the financial institutions continue to focus on fault tolerant operations. With hundreds of millions of dollars on the line, banks and brokerages require extensive computer and networking duplication, precise error-checking routines, and robust systems software. As such, this

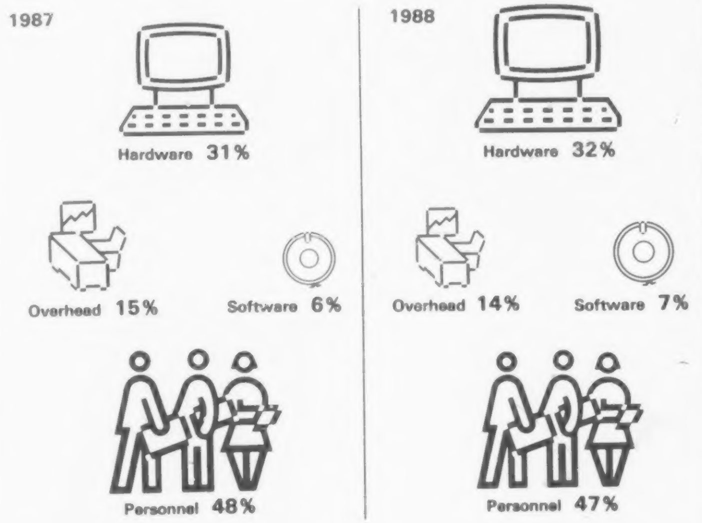
The Top 10

COMPANY	IS INTENSITY	ASSETS ($ MIL)	PROFIT ($ MIL)	FY END
Citicorp	+	203,607	(1,138)	12/31
American Express Co.	+	116,434	533	12/31
Federal Natl. Mortgage Assn.	–	103,459	376	12/31
BankAmerica Corp.	+	92,833	(955)	12/31
J.P. Morgan & Co. Inc.	–	75,414	83	12/31
Salomon Bros. Inc.	=	74,747	142	12/31
Manufacturers Hanover Corp.	=	73,348	(1,140)	12/31
Bankers Trust New York Corp.	=	56,521	1	12/31
Merrill Lynch & Co. Inc.	+	55,196	391	12/31
First Interstate Bancorp	=	50,927	(556)	12/31

* = means company spends about the same percentage of its revenue on IS as the group mean. + means it spends a larger percentage. – means less. Parentheses represent losses.
Source: DATAMATION

Distribution of IS Funds by Percent

Belt-tightening in response to falling profits has changed the picture at some big banks.



Source: DATAMATION

industry is more open than others to innovations in IS that ensure increased reliability as well as the more common goals of faster and more powerful functionality.

It is also in the banking and finance sector that frontier technologies often find their first commercial application. With the dispersed branches of banks and the widespread sales offices of the brokerage firms, this industry has been in the forefront of integrating advanced communications technologies such as satellite transmissions and fiber-optic networks into their operations. And, with their requirement of storing billions of bytes of archival information, the financial firms are major buyers of massive data storage systems such as laser videodisks.

This business also demands constant attention to the dynamics of customer interaction with the institutions, and some of the leading firms are exploring artificial intelligence to make these interactions more efficient. American Express has deployed one of the first major applications of an expert system with its "authorization assistant" program. The program applies the same rules as the firm's 300 authorizers to determine whether or not certain customer transactions should be allowed.

BANKING & FINANCE
CASE STUDY

IS Growth Checked

At Manny Hanny, IS spending has leveled off, but the big bank still sees automation as the key to reduced operating costs.

BY TOM McCUSKER

After seven years of breakneck investment in IS systems, Manufacturers Hanover Corp. has eased up a little this year. The $73 billion bank wants to make sure that its information systems have a direct relationship to its "effective and efficient" performance, explains Steven L. Sheinheit, senior vice president for strategic technology research.

"One of our goals is to get our investments in technology better aligned with the strategies of our various businesses," Sheinheit adds. These strategies can be tied to both growth and cost-reduction applications at the big money-center bank.

For example, Sheinheit thinks the bank's traditional businesses, which involve the handling of tremendous amounts of paper, require a reautomation of back office systems. Manufacturers now is looking at approaches to more efficient handling of paper, including the use of imaging systems.

Manufacturers Hanover is also applying technology to investment banking activity, which it expects to become a growing source of new revenues. For example, Manufacturers Hanover has installed an expert system, called Trading Advisor, to assist the people involved in making investment banking decisions. It will soon add other expert systems that are linked with the bank's networks of databases. Sheinheit sees other systems being added to replace investment banking's reliance on outside timesharing services and software packages.

The bank's 1988 investment in information systems of $382 million may be down slightly from last year because some elements in the bank's businesses aren't charged entirely to IS. For example, Sheinheit points out, many departments have personal computer operations where IS pays for some hardware, software, and consultants, but not for the staff. This represents about 10% of the IS spending budget. "Then there's another 5% to 10% that we can't find," he says.

Manufacturers spent heavily on information systems through most of the 1980s. IS spending was advancing at least 17% a year until 1987, when banks began reporting losses. But the slowdown in spending is probably temporary, and budgets are expected to rise during the next five years as technology solutions are applied to larger and larger bases within the bank. Sheinheit says people are coming around to realize that spending for automation often is the key not only to efficiency but to drastic reductions in operating costs.

Communications between the providers of IS technology and users are increasing all the time, says Sheinheit. The two groups set budgets together to establish planning processes for the implementation of high technology. The IS people provide management systems to measure factors such as product life cycles.

"Users now want improved negotiation procedures with IS," Sheinheit says. "They bring us what they want to have done and let us know what dollars they have. Then they ask us to prioritize these functions."

Manufacturers Hanover is applying IS technology to investment banking activity.

Photograph by Robert Llewellyn/Four By Five

Their Own Best Customer

Electronics companies are their own biggest fans: a whopping 4% of their annual revenues is budgeted for information systems. And, yes, they give themselves a discount.

Not the sort to slight their own products, the top 10 electronics companies lead all other industries in their IS expenditures as a percentage of revenues. The largest firms in this sector spent approximately $5.8 billion or 4% of their $145.9 billion 1987 revenues on in-house information systems. The figure would be even higher except that the computer manufacturers of the group can avoid paying list price on the major components of their systems. The percentage this industry sector spends on hardware and software will be slightly lower during 1988 than in 1987, which reflects some of the savings manufacturers realize on their own products. But they make up for this with increased spending on personnel. The aggregate amount spent will increase significantly this year as the electronics industry rebounds from its bleak years in the mid-1980s.

In many ways, the electronics companies mirror their counterparts in other industries in administrative computer usage. But the high-tech companies are trendsetters in IS operations extending well beyond ever-present payroll and personnel-type applications. Most notable are applications in the engineering and manufacturing sectors, their costs often falling outside the corporate IS budget. Complex microprocessor designs push CAD systems to their limits. In their manufacturing operations, electronics firms bank heavily on integrated manufacturing systems, which help meet both high output demands and precise design tolerances common to the industry.

In sales and marketing, the electronics industry leaders constantly look for new ways to exploit the potential of their own products. Detailed databases of customers' specific applications and operations, and computer-based catalogues of parts and optional design configurations help sales staffs and field support personnel deal with evolving hardware and software product lines.

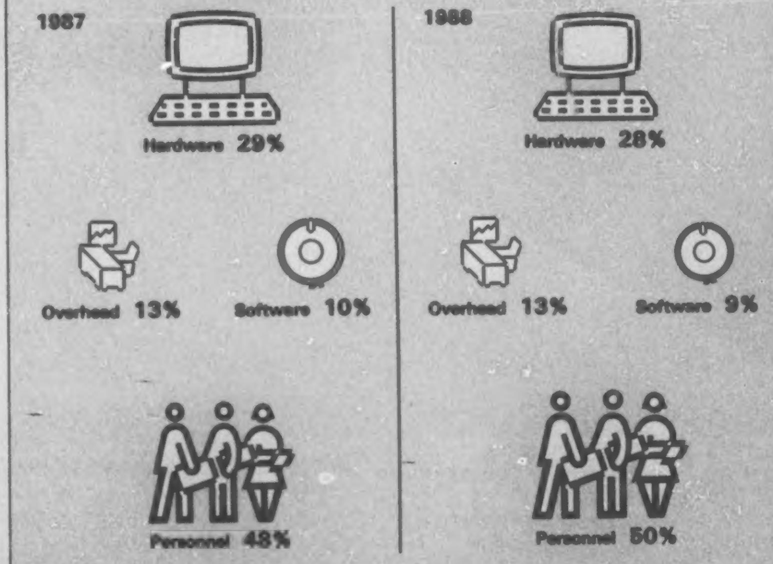
The Top 10

COMPANY	IS INTENSITY	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
IBM	=	54,217	5,258	12/31
General Electric Co.	–	40,515	2,915	12/31
Digital Equipment Corp.	+	11,475	1,300	6/28
Xerox Corp.	+	10,550	578	12/31
Unisys Corp.	=	9,713	578	12/31
Hewlett-Packard Co.	=	8,090	644	10/31
Honeywell Inc.	–	6,679	253	12/31
Control Data Corp.	–	3,366	19	12/31
Intel Corp.	+	1,907	176	12/26
Square D Co.	=	1,484	99	12/31

*= means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; – means less.
Source: DATAMATION

Distribution of IS Funds by Percent

These are the heaviest IS users, and, were it not for discounts, hardware's share of spending would be higher.



Source: DATAMATION

The fast-paced nature of the electronics industry demands that the major players employ their own products in every stage of their business: product life cycles average only two to three years in some niches and the pressure to introduce new equipment and upgrade the old is intense. As these new products come on-line in the market, the electronics vendors are typically the first to incorporate them into their own operations. The companies often serve as their own test beds, hitting the IS budget for substantial personnel costs. Although the goal of the vendors is to provide a smooth transition path from their older products to newer ones, the reality of such constant in-house upgrading calls for high-salaried technicians, systems engineers, and applications programmers.

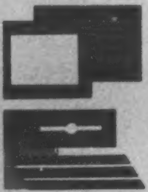
The electronics companies also lead in the use of office automation technologies, such as word, document, and image processing, electronic mail, voice store-and-foward systems, extensive networks of pcs and workstations, peripheral devices, and communications equipment. Like systems for design and engineering, much of this equipment is "off-budget" and is acquired by company divisions independent of the corporate IS budget.

ELECTRONICS
CASE STUDY

Success Stories at HP

Hewlett-Packard's goals are speedy response times and deep databases, all to keep customers coming back for more.

BY TOM McCUSKER



Hewlett-Packard Co. views its marketplace as fiercely competitive and increasingly global in scope. "Those who are fastest on their feet are the ones who will be most competitive and thus prosper," says Lloyd Taylor, director of corporate information systems at the huge Palo Alto electronics manufacturer.

This understanding of competitiveness is reflected by the company's information systems operation. For example, IS at HP has furnished its 3,000-person U.S. sales force with laptop computers and access to databases—among them, some still under construction—that provide data enabling salespeople to offer faster response to customers. The databases provide qualified sales leads and will give sales staffers access to such helpful information on these prospects as historical data about their purchase needs over long periods of time. By the time all of the databases are completed, salespeople from all over the world will be communicating on HP's X.25 protocol network.

Already widely known for its implementation of computer integrated manufacturing systems, the company is brimming with success stories that show product improvement resulting from these implementations. While the use of computers for factory floor automation, engineering design, or anything else directly related to the product development process does not fall under the IS function, IS nevertheless provides the information flow in these applications.

For example, Taylor points to what he calls "an integrated flow of information" between product design groups and manufacturing, a flow that reduces product cycle times. Among the products of this information flow is improved manufacturability of products, and the ability to design fewer and more specific parts—important characteristics in such processes as flexible and just-in-time manufacturing.

Still another development that Taylor says will aid the company in responding to customers is an expert system that will configure computer systems. He admits the concept isn't new. Digital Equipment Corp. has been configuring computers with its own expert system since the early 1980s. But Taylor said the system, due to become operational in mid-1989, will be valuable to Hewlett-Packard in shaving both time and required parts from its customer proposals.

Each of the company's business units determines what it should spend on hardware and software, while corporate IS consults with these divisons to integrate the information flow and supply of productivity tools and communications services. Spending for IS in recent years has grown in direct proportion to total revenue growth—about 14%. HP's 1988 IS spending will reach $320 million, rising to $365 next year, with similar growth rates continuing well into the 1990s, Taylor predicts. As a percentage of HP revenue, IS spending remains at about 3.5%.

At Hewlett-Packard, spending for IS has grown in direct proportion to revenue growth.

Photograph by Scott Berrow/Four By Five

Steady IS Consumption

Low-margin, high-volume businesses spend a lot on tracking products, but Coke's computer-resident spokesman, Max Headroom, is an off-budget item.

The percentage of revenues spent on information systems by the major food and beverage companies held steady at 1.6% from 1986 to 1987. Revenues at the top 10 of these firms rose 9% to $113.7 billion during that period, bringing the total IS expenditures to $1.8 billion last year. As in the past, these companies tend to be conventional users of computers, with the bulk of their applications tied to corporate accounting and record-keeping tasks. Like their counterparts in the automotive and financial industries, the major food and beverage firms cut their overhead and personnel costs during 1988, while spending more on hardware and software.

With their businesses centered around high-volume, low-margin products, much of the computer power expended at the food and beverage firms is spent on coordinating production and shipment of products with fluctuating demand from distributors and retailers. This necessitates sophisticated production control and inventory systems as well as applications software that tracks and projects demand and profiles markets. These companies are also big users of billing and order entry systems, although they can often rely upon standard software packages to handle these jobs.

Food and beverage suppliers have also increased their reliance upon computer control in their factories. Beverage companies in particular share many production traits with the process industry, and benefit from the exact timing of manufacturing steps and the precise mixing amd movement of ingredients that factory automation permits.

The proportion of information systems expenses devoted to marketing and sales functions at these companies is also increasing. Marketing applications have become especially critical in situations such as the taste-test war between Coca-Cola

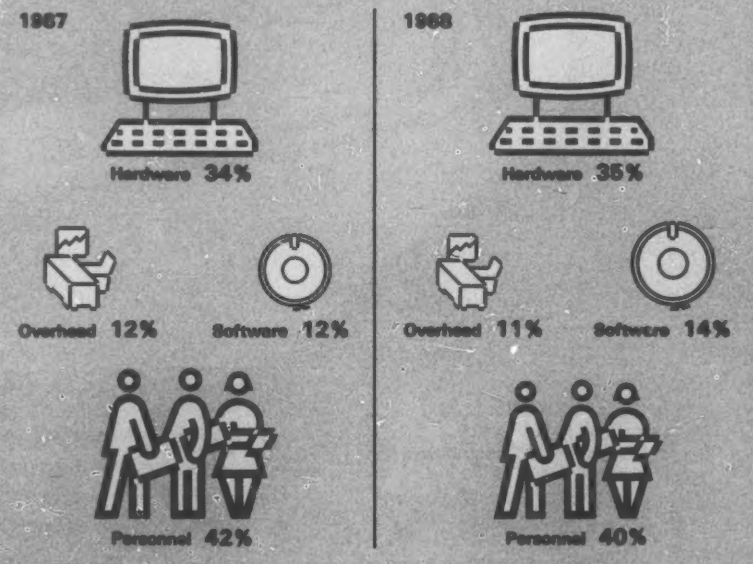
The Top 10

COMPANY	IS INTENSITY	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
Philip Morris Cos. Inc.	+	27,695	1,842	12/31
RJR Nabisco Inc.	=	15,766	1,209	12/31
PepsiCo Inc.	=	11,485	594	12/28
Kraft Inc.	=	9,876	489	12/21
Sara Lee Corp.	=	9,155	267	6/30
American Brands Inc.	=	9,152	522	12/31
ConAgra Inc.	=	9,002	149	5/25
Anheuser-Busch Cos. Inc.	+	8,258	614	12/31
Coca-Cola Co.	+	7,658	916	12/31
Pillsbury Co.	–	6,128	182	5/31

*= means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; – means less.
Source: DATAMATION

Distribution of IS Funds by Percent

Major food and beverage companies cut overhead and personnel costs and spent more on hardware and software.



Source: DATAMATION

and PepsiCo. Supporting sales personnel with up-to-date information on special offers, product availability, and market figures has become imperative at the leading vendors. More and more, these data are distributed to regional and district representatives via terrestrial and satellite networks. Likewise, customer orders and other local information can be uploaded to corporate headquarters over the same communications routes.

Compared with other industry sectors, the food and beverage companies continue to spend lower percentages of their IS budgets on personnel. This cost is slowly increasing, however, as the leading companies branch into areas that can't be adequately addressed by canned software. Still, this industry continues to be characterized by a high rate of mergers and acquisitions, and the incentive to reduce the pain of integrating acquired computer operations with those existing at the parent company remains strong. As such, these companies will try to maintain standard software and systems for traditional corporate computing tasks, while building custom applications in more independent operations such as factory automation and sales support.

FOOD & BEVERAGE
CASE STUDY

Aiming to Save Dough

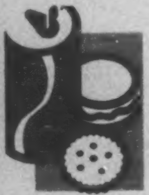
Pillsbury is fighting a takeover bid while it builds an integrated IS structure for its troubled Burger King operation.

BY TOM McCUSKER

BURGER KING
HOME OF THE WHOPPER
Brazier
ITS HERE 16 OZ UPSIDE DOWN GLASS WITH SOFT DRINK

Pillsbury is developing an integrated information program for its Burger King Corp.

Photograph by David Hiser/The Image Bank



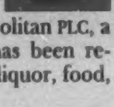
In the fiercely competitive and merger-manic food and beverage industry, spending plans that have any relation to company strategy are considered secret.

This is even more pronounced when it concerns information systems at Pillsbury Co., Minneapolis, which this fall was in the midst of a bitter battle against a hostile takeover. Its information systems director, John Hammitt, had abruptly left the company for United Technologies in Hartford, Conn. His successor, Carl Wilson, said that for the time being any kind of data on Pillsbury's information systems operations was "company confidential."

IS has a crucial role in the huge $6 billion company's strategy, however. For example, sources report that Pillsbury is in the midst of developing an integrated information program for its troubled Burger King Corp. fast food chain. The goal is to improve the 5,680-unit chain's poor performance by integrating all functions—including point-of-sale activity—and by tracking inventory needs in an on-line fashion.

Among Pillsbury's other strategic information systems efforts is the use of technology to improve its position as a low-cost supplier to customers, for example by making wider use of electronic data interchange for receiving orders, invoicing, and being paid.

Information officers in each of its five business units determine the technology to be used, and the dollars to be spent, to achieve Pillsbury's strategic goals. Until this year, what they said they needed was generally being heeded by top management: Pillsbury's 1988 IS budget of around $120 million is about 10% ahead of the prior year. According to some sources, this increase was achieved despite pressure to reduce spending throughout the company.

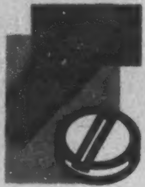


Spending in the future is in doubt, following a $5.23 billion takeover bid made last month by Grand Metropolitan PLC, a British conglomerate that has been restructuring itself as a global liquor, food, and retailing organization.

Pillsbury has been under pressure to sell off some of its restaurant group, but consistently has refused. And while there has been much talk before of a Pillsbury takeover, potential bidders have shied from having to swallow the Burger King operation. But not Grand Metropolitan, which has plans to extend the chain's operations overseas. Only 10% of Burger King's stores are overseas, compared with 25% for archrival McDonald's Corp., giving Grand Metropolitan plenty of room in which to grow.

Prescription For Success

Personnel's bite of the health and pharmaceuticals IS dollar is the largest of any industrial sector. The villain may be a dearth of packaged software that fits the prescription.



While IS spending at health care and pharmaceutical firms is increasing, the industry lags all but the retail sector in the percentage of revenues it devotes to information systems expenditures. (The percentage for Banking & Finance is figured on assets.) Still, the percentage of revenues spent in 1987 rose to 1.1%, up from 0.6% in 1986. This translated into an aggregate IS budget of $576 million at the top 10 companies. Despite its relatively low IS expenditures, this industry remains one of the most dependent upon computer and communications facilities. Moreover, personnel costs remain the highest, relatively, of all industry sectors, reflecting an inability to meet computing needs with standard software packages. Despite this dependence on personnel, 1988 budgets show a decrease in personnel spending and an increased investment in the software to run the computers that control many of the production and laboratory processes.

Clear differences exist between the pharmaceutical and the health care companies in this sector. The former, with their heavy emphasis on research, have considerable off-budget expenses in laboratory computer systems. In recent years, the research arms of the drug manufacturers have looked to the horsepower of supercomputers and minisupercomputers for assistance in everything from calculation of complex formulas to the modeling of a drug's molecular structure. In addition, the pharmaceutical firms now rely upon the precision of computer controls for their drug production lines.

Once drugs are in clinical trials, computer systems track patients' conditions and lab results. Since these trials can last from months to years, programs must be devised that can identify and track statistically significant variations in patient symptoms over time. As an industry under close government scrutiny and regulation, the pharmaceutical firms call upon

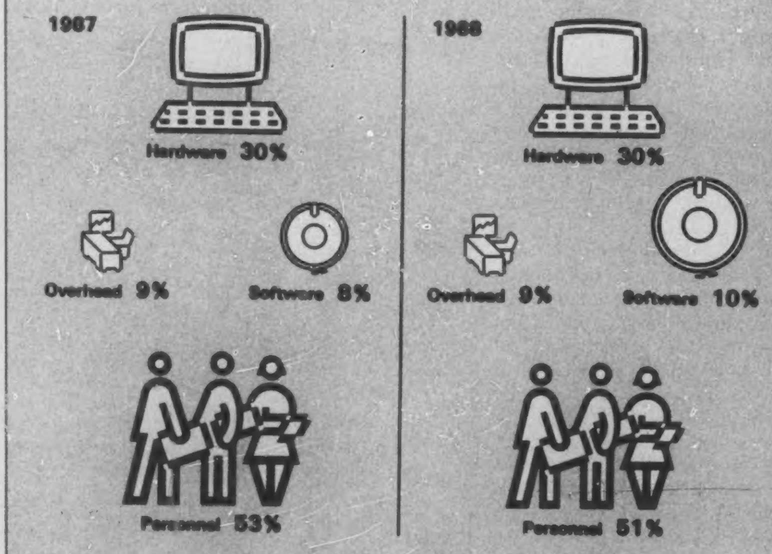
The Top 10

COMPANY	IS INTENSITY	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
Johnson & Johnson	+	8,012	833	12/31
McKesson Corp.	=	6,671	231	3/31
Baxter Travenol Labs Inc.	=	6,223	692	12/31
Bristol-Myers Co.	=	5,401	709	12/31
Merck & Co. Inc.	=	5,061	906	12/31
American Home Prod. Corp.	+	5,028	846	12/31
Pfizer Inc.	+	4,919	690	12/31
Hospital Corp. of America	–	4,676	(58)	12/31
Bergen Brunswig Corp.	+	3,376	16	12/31
[illegible]tl. Medical Enterprises Inc.	–	2,881	140	5/31

= means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; – means less. Parentheses represent losses.
Source: DATAMATION

Distribution of IS Funds by Percent

Personnel's big chunk of the IS dollar in this industry is coming under increasing control.



Source: DATAMATION

computers to help process the mountain of required forms and documents.

For health care providers, patient record-keeping represents a major application, one where standard database management systems often suffice. A key consideration here, though, is system security, with providers restricting access to these records to authorized personnel. Meanwhile, lab testing and analysis are dependent upon computer control, as are the sophisticated monitoring machines employed with critically ill patients. Although advanced diagnostic tools such as computer aided tomography and nuclear magnetic resonance fall outside of the corporate IS budgets of these firms, they nevertheless represent a considerable computational expense.

The importance of rapid integration of patient information from different departments of health care facilities has caused many to invest in local area networks. By linking labs and X-ray rooms to nursing stations and administrative offices, the facilities realize savings in operational costs while improving the efficiency and quality of their health care.

Billing remains one of the most demanding of applications for the health care providers. Unlike bills for straightforward transactions where customers buy a single product or service, hospital bills can contain tens of categories covering prescription costs, laboratory fees, and consultation expenses in addition to basic room and care rates. And, like the pharmaceutical firms, the health care providers have more than their share of government regulations to meet, which they do largely with the assistance of their IS departments.

HEALTH CARE
CASE STUDY

IS Drives Distribution

McKesson gears IS toward two goals: providing more services to customers and operating with Spartan efficiency.

BY TOM McCUSKER

McKesson Corp. of San Francisco is the largest drug distributor in the U.S., with 50 distribution centers throughout the country and annual sales of more than $6.6 billion.

It operates on tight margins of under 10%—margins that are always under pressure, says Jon d'Alessio, vice president of operations planning and information technologies. D'Alessio adds that McKesson's 25,000 customers, chiefly pharmacies, store chains, and hospitals, have a seemingly insatiable appetite for services from the company. Therefore, it is no surprise that McKesson has been gearing its information systems activity toward two goals: providing more services to customers and operating with Spartan efficiency. The key to success, says d'Alessio, is a 15-year-old electronic distribution system, called Economost, that is continually being refined and expanded. This year, nearly all of McKesson's customers have been hooked to the system, which automatically takes orders from the customers, processes them at a data center in Sacramento, Calif., and dispatches the orders to its 50 warehouses.

The system even provides retail price stickers for individual products according to customers' targeted markups. A box of 12 toothpaste tubes, for example, will be sent to a customer along with 12 price stickers printed with the amount predetermined by the specific store.

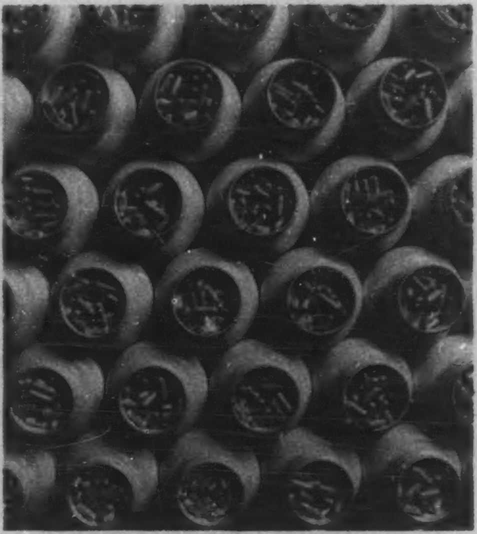
Last May, McKesson installed a satellite network to transmit data between the Sacramento data center and the warehouses. The system became operational a few days before a fire crippled an AT&T network transmission station in Chicago. "Our competitors couldn't get their orders out to their warehouses," chuckles d'Alessio, "while we were running smoothly." D'Alessio says it is a top priority to continue to make Economost more flexible and easier to use by customers. "It gives us the competitive edge," he asserts.

To prepare the company's annual spending plans, its five business units first draw up lists of priorities. "They look at what they're spending this year and how we're making out on backlogs of software development. Then we agree that we can only slug it out three years at a time." Throughout the process, however, users and their IS people, working closely together, set the agenda.

This year, McKesson will spend about $85 million for IS and about 10% more in 1989. Down the road, d'Alessio thinks spending will rise at a slower rate because of the operating leverage current that IS systems have given the company.

Unattended operations is one of the company's goals, particularly at its Sacramento data center, which is already getting by with fewer and fewer people every year. "More and more," d'Alessio observes "we're beginning to call it the 'morgue,' it's so quiet." He thinks his warehouses, which use IBM System/36 systems, might be candidates for unattended operation if McKesson moves to the IBM AS/400 successor computers.

"We're not in a hurry, though," d'Alessio concludes. "We need these systems to work, and it's good to know there are people around in case anything goes wrong and half the corporation would be down. You can't take orders by hand."



McKesson will spend about $85 million for IS in 1988.

Photograph by Charles Orrico/Four By Five

Driven To Compute

They are the big spenders in the survey. Industrial and automotive companies have the biggest aggregate revenues and devote an above-average hunk to IS.

The industrial and automotive top 10 continue to dominate the IS user marketplace, thanks to the coupling of impressive revenues with an intensive use of computers and communications in all aspects of their business. Only the petroleum and petrochemicals leaders' revenues surpassed the $286 billion realized by this sector in 1987, and the oil industry spends just 1.3% of its revenues on IS compared with industrial and automotive's 2.7%. This 2.7% translates into an aggregate IS budget of $7.75 billion for the top 10 last year. During 1988, there has been a shift in the allocation of IS funds. Hardware spending will increase slightly, draining capital resources previously spent on software and personnel.

The carmakers and plane manufacturers represent the largest commercial users of high-cost supercomputers. Despite the multimillion-dollar expense of acquiring and operating these number crunchers, these firms have been able to justify the cost by modeling and testing new designs on the computers rather than through the time-consuming and error-prone production of actual scale models. Processing tens to hundreds of millions of instructions each second, the supercomputers perform simulated crash testing of cars, analyze stress points of parts under extreme conditions, and model the fluid flow of air over a plane's wings. Wind tunnels aren't obsolete yet, but they're becoming increasingly secondary to the mathematical proof.

Moving design to production is becoming more and more automated at the auto manufacturers, with CAD equipment linked to factory-floor equipment. Digital output from the CAD systems is fed directly into numerically controlled production machinery; assembly-line robots piece together discrete components, weld frames, and paint auto bodies; vision systems search for flaws in parts. Coordinating

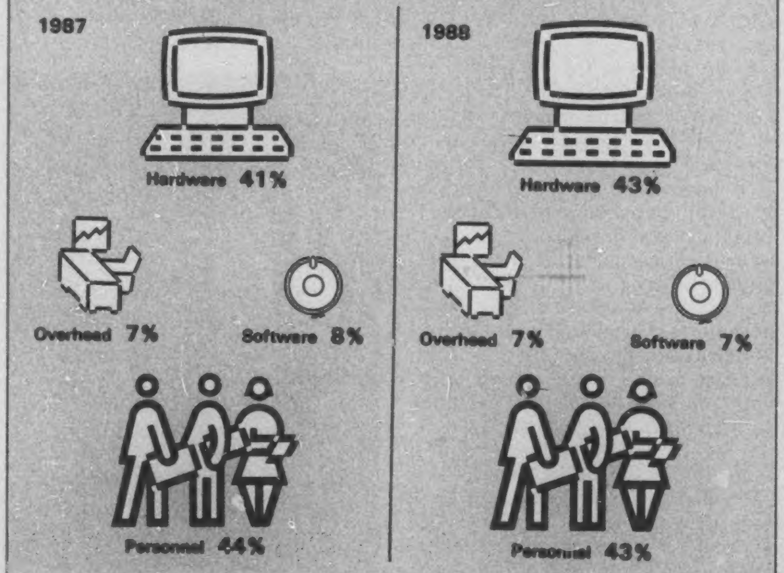
The Top 10

COMPANY	IS INTENSITY	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
General Motors Corp.	+	101,781	3,550	12/31
Ford Motor Co.	–	62,716	4,625	12/31
Chrysler Corp.	–	26,276	1,289	12/31
United Technologies Corp.	+	17,170	592	12/31
Boeing Co.	+	15,355	480	12/31
McDonnell Douglas Corp.	=	13,344	313	12/31
Rockwell Intl. Corp.	=	12,123	635	9/30
Lockheed Corp.	=	11,321	421	12/31
Allied-Signal Inc.	–	11,116	656	9/30
TRW Inc.	=	6,821	243	12/31

*= means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; – means less.
Source: DATAMATION

Distribution of IS Funds by Percent

In 1988, hardware spending increased slightly, draining capital resources previously spent on software and personnel.



Source: DATAMATION

these processes are superminicomputers linked to high-speed local area networks, some of which use fiber-optic technology both for its transmission volume capacity and its immunity to factory-floor electrical noise. General Motor's MAP communications protocols continue to advance the cause of networking standards in such environments.

All of the top 10 companies in this sector are dependent to one degree or another on defense industry contracts, and their in-house computer facilities play an important role in everything from preparing bids to developing prototypes to documenting products. Companies in this business are among the major users of internal electronic publishing systems. In the documentation process—which, for complex pieces of equipment such as fighter planes, can entail the generation of thousands of pages of text and illustrations—the publishing systems are becoming indispensable. They maintain audit trails of revisions and corrections by date and by author, merge text from standard word processing systems with CAD generated illustrations, and interface to high-quality output devices such as typesetters and laser printers.

IS departments within these firms have also become critical in the maintenance of parts inventories, the scheduling of production lines, and the sales and marketing of products. Considering the importance of such a broad range of applications, it's easy to overlook the fact that the industrial and automotive firms have equally impressive IS facilities to deal with such mundane tasks as maintaining records on their vast employee populations and meeting payrolls.

INDUSTRIAL & AUTO
CASE STUDY

A Strategy per Customer

Rockwell's IS organization spreads through its 50 businesses: only a third of its IS budget is spent at headquarters.

BY TOM McCUSKER

Rockwell International Corp. runs a highly decentralized information systems organization that mirrors the company's organization as a collection of nearly 50 divisions in the automotive, printing press, electronics, and aerospace businesses. Overall revenues total more than $12 billion.

Each division has its own IS activity and its own strategies, often tied to the strategies of its customers. For example, Rockwell's automotive companies have systems that are designed to deal with Ford and Chrysler's very different proprietary systems, explains J. David Mitchell, vice president of strategic planning and CIM development at Rockwell's IS headquarters in Seal Beach, Calif.

The budgeting process also follows the company's decentralized structure. IS spending at the divisions is determined through normal budgeting processes—working within divisionwide business and capital plans—and the strategies are approved by senior management. Mitchell says that many divisions have standardized their use of personal computers, limiting the number of vendors and requiring that a minimum number of software packages be included with each personal computer.

Despite the decentralization, Rockwell companies can access the company's huge regional business and scientific data centers in Seal Beach and Dallas. The centers handle financial services, payroll, manufacturing resource planning systems, and engineering data systems: "Anything the companies feel they'd like to have done outside," Mitchell explains.

Mitchell adds that Rockwell's strategy is for its subsidiaries to take increasing control of their IS activities. For example, almost 36% of the $433 million to be spent on IS at Rockwell this year will represent the corporate IS activity, which includes the two regional centers. Five years out, the spending level will rise to $525 million, but headquarters will represent only 34% of the total, Mitchell says.

Each Rockwell division has its own IS plan.

Photograph by Al Satterwhite/The Image Bank.

To arrive at these spending totals, information systems executives in the various businesses have built up a set of data to break out total IS spending. "The real IS component is being defined very precisely by IS organizations, and the process has been maturing each year," Mitchell adds. "They know what is going on."

Keeping information systems staffs aware of new technology is accomplished by what Mitchell calls technical councils and technical task groups, sponsored by corporate IS. These councils and groups are part of a process designed to encourage the sharing of technology among the companies, "to prevent reinventing of wheels."

Mitchell says the company has been looking at computer aided software engineering (CASE) tools to enable more effective programming of software contained in products made by Rockwell. Rockwell's businesses make wide use of expert systems, many of them embedded within products. Rockwell's printing presses have expert systems embedded within their controls, as do the avionics in the cockpits of aircraft. Many of Rockwell's systems products are configured for customers through the use of expert systems, but as yet the company doesn't see these expert systems as solutions in the engineering and factory products it sells.

As for the headquarters IS role in new applications, Mitchell says, "We bring people and ideas together to share our knowledge and to probe theirs. We act as a catalyst."

Premium IS Policies Pay Off

In a good year for the insurance business, the big spenders got control of personnel costs. Hardware and software took a bigger share in an IS-intensive industry.

The leading insurance companies had a good 1987. Revenues jumped 20.5% to $120.5 billion. Of this, a healthy 2.2% was devoted to corporate information systems, resulting in an aggregate budget of $2.65 billion. This amount put the top 10 insurers on a par with the IS expenditures at their counterparts in the utilities industry, and in the top half of the 12 industries surveyed. The insurance companies are near the industry average in the way they apportioned their budget among the four categories of hardware, software, personnel, and overhead. Like many of their industrial counterparts, 1988 insurance company budgets reflect savings on personnel and overhead with commensurate increases in hardware and software spending.

Unlike sectors such as the industrial and automotive, process, and electronics industries, the insurance business has no inherent computer expenses in the manufacturing and production realm, although firms such as ITT do have divisions that are industrial in nature. Insurers make up for this lack of IS breadth by being among the most highly automated office and administrative users of computers. Virtually every desk at corporate headquarters as well as at agency offices is adorned with a personal computer or terminal, and these are linked by both local and wide area communications networks.

Mainframe computers at headquarters facilities perform prodigious processing of client policies, records, and claims. As such, the insurance industry has always been a leader in the testing and employment of database management techniques and software. The top insurers are among the major users of specialized hardware such as database management machines and image processing systems.

In the face of growing claims litigation costs as well as tight government regulations—both at the state and federal levels—the insurers are turning to their IS

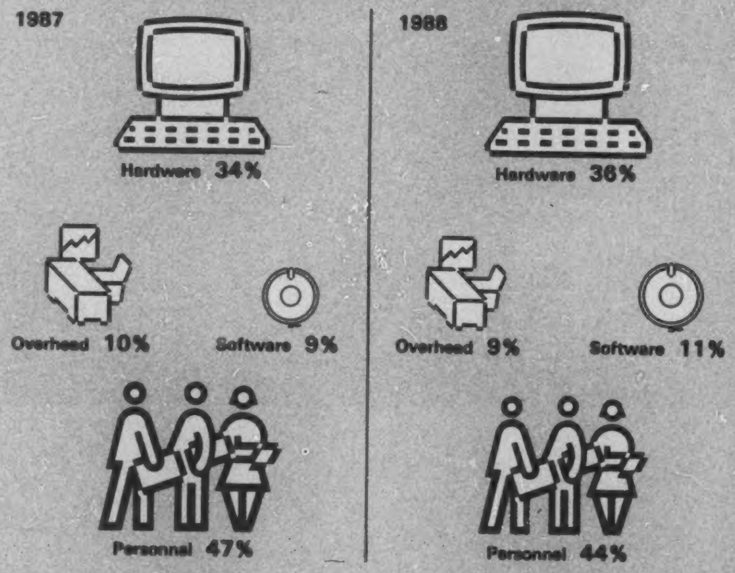
The Top 10

COMPANY	IS INTENSITY	REVENUE ($ MIL)	PROFITS ($ MIL)	FY END
Aetna Life & Casualty Co.	+	22,114	921	12/31
ITT Corp.	+	19,524	1,018	12/31
Travelers Corp.	=	17,500	428	12/31
Cigna Corp.	=	16,909	728	12/31
American Intl. Group Inc.	=	11,728	945	12/31
Loews Corp.	=	9,323	696	12/31
Transamerica Insurance Co.	=	7,175	427	12/31
American General Corp.	=	7,157	555	12/31
Continental Corp.	=	5,801	234	12/31
St. Paul Cos. Inc.	=	3,366	357	12/31

* = means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; – means less.
Source: DATAMATION

Distribution of IS Funds by Percent

Insurance companies are near the overall average in apportioning their budget among hardware, software, personnel, and overhead.



Source: DATAMATION

departments for risk management and decision support applications. Such software is increasingly available off the shelf, and companies in this sector have become prime candidates to acquire it. Rate setting has become an intricate science of balancing the cost of claims with various risk factors and operating expenses, and in-house applications programmers constantly tweak and modify the systems.

Insurers have long been active in profiling their customer bases to arrive at risk assessments. Computers deliver the power to accurately compare driving records across different population groups, to calculate the risks of insuring homes and automobiles in particular neighborhoods, and to establish life-expectancy tables.

The insurers' information systems departments are also being called upon to assist in the marketing of policies, especially to corporate clients. Electronic publishing systems tied into computer graphics packages are used by the insurance vendors to prepare slick company-specific presentations to sway potential customers. Corporate computers churn out analyses of new market opportunities and they direct attention to sectors that have begun to slip. In a business built on risk, the IS operations in the insurance industry serve to reduce the gambles undertaken by the insurers themselves.

INSURANCE
CASE STUDY

Insuring Good Decisions

Transamerica's IS operation builds decision support and provides instant access to the profit picture.

BY TOM McCUSKER

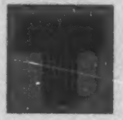
Information systems are enabling large organizations like Transamerica Corp. of San Francisco to cope quickly and efficiently with outside pressures that would have bewildered executives only a few years ago. Senior executives in these companies are using computers directly in their decision-making functions.

"Decision support systems on pcs have an increasing role in the way these executives conduct their jobs," observes Pete Dawson, vice president of information systems at Transamerica. "They are not afraid to develop models or their own databases to keep track of things that are critical to the businesses they manage."

At Transamerica, as at countless other companies, IS systems go well beyond the pc to help management in developing strategies more rapidly to meet shifts in business conditions, i.e., they address such factors as interest rate changes (the place where insurance companies are vulnerable); pricing fluctuations in the casualty insurance business; changes affecting world trade in the container leasing business; and, more recently, changes resulting from tax reform. Dawson notes, for example, that IS provides profit information almost immediately and has computer programs that aid in better utilization of the container fleet. "They help management to react to these changes in a more competitive way," he adds.

As these systems proliferate, Transamerica is making an effort to better account for the IS content in its various businesses, Dawson says. For example, this year the company will spend $160 million for information systems, including hardware, and next year that figure will increase by 8% or 9%. "But part of the increase will be due to better accounting," explains Dawson. For example, pcs often are buried in other budgets, and nondedicated voice and data networks are not identified as IS. Typewriters and word processors are considered to be administrative costs until they're replaced by pcs. So are communications services, which were considered to be non-IS until they began carrying electronic mail.

Dawson says that tighter accounting procedures influence the decision-making process in setting up spending plans at the company. New expenditures as well as better detection of IS content will send the company's IS spending level up 16%, to $190 million, by 1992.



Directly involved in approving budget requests, ceos of Transamerica business units exhibit increasing appreciation for the IS function. Nearly all IS officers report to ceos today, says Dawson, a trend that has evolved as IS "outgrew financial areas of the business and began moving into operating areas."

The company is examining ways to reduce its software development costs and waits expectantly for computer aided software engineering tools to mature. So far, it has not implemented CASE tools except on a trial basis. Other technologies, such as AI and accompanying expert systems, are "more than we could possibly implement," says Dawson.

Transamerica's IS systems help management in meeting rapidly shifts in business conditions.

Photograph by Bill Longcore/Photo Researchers

Mining the Data Lode

Rushing to diversify, the metal industry integrated new businesses at a furious clip. Result: the percentage this sector spends on IS personnel is the survey's highest.

Historically, companies in the metal and metal products sector lag other industries in IS expenditures. Last year was no different. The top 10 metal firms fell into the bottom quarter of the 12 industries surveyed, spending just 1.2% of their revenues on corporate information systems. Still, this percentage represented a small rise from the previous year's, and revenues themselves were up a healthy 15% over those in 1986, reaching $51.8 billion. The aggregate profit picture at the big 10 also improved from 1986 to 1987, moving from a loss of $1.6 billion to a gain of $1.3 billion. As this gradual growth continues, it will be reflected in the total IS budget for the top 10 metal companies, which in 1987 stood at $622 million.

The leaders in this industry also lead in diversification activity, as they try to shore up the weakened walls of their core business. As the metal firms bring new subsidiaries under their wings, the corporate IS departments strain to integrate the diverse operations into their bookkeeping and personnel applications. This demand is adding to personnel costs, with the IS departments adding applications programmers, systems engineers, and data entry staff to their rosters. In 1987, the metal and metal products sector equaled the health care and pharmaceuticals industry in the percentage of IS funds devoted to personnel. Only the utilities companies devoted more of each IS dollar to personnel. This year, the metal companies caught up and will spend a higher percentage on personnel than any other sector. Figures for 1988 also show these companies spending proportionally more this year on personnel and overhead than they did last year.

Despite diversification, the metal producers haven't abandoned their mainstay businesses. Most are beefing up the process control and factory automation aspects of their mills in an attempt to

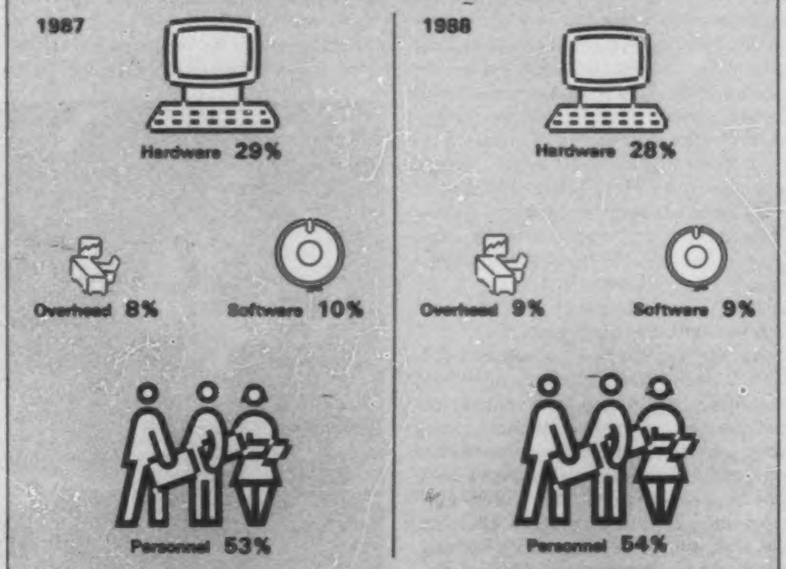
The Top 10

COMPANY	IS INTENSITY	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
USX Corp.	+	14,836	219	12/31
Aluminum Co. of America	=	7,767	200	12/31
LTV Corp.	=	7,582	502	12/31
Bethlehem Steel Corp.	=	4,620	174	12/31
Reynolds Metals Co.	+	4,316	219	12/31
Inland Steel Industries Inc.	=	3,453	145	12/31
AMAX Inc.	–	3,383	51	12/31
Armco Inc.	=	2,927	117	12/31
Kaiser Aluminum & Chemical Corp.	=	2,085	(362)	12/31
Commercial Metals Co.	–	880	10	12/31

* = means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; – means less. Parentheses represent losses.
Source: DATAMATION

Distribution of IS Funds by Percent

The top metals firms fell into the bottom quarter of the 12 industries surveyed, spending just 1.2% of their revenues on IS.



Source: DATAMATION

improve efficiency and bolster their competitive stance. Much as have the process industries—a group with which they share many traits—the metal producers are turning to computer integrated manufacturing techniques to monitor and control the volatile production processes. Precise control helps ensure metal consistencies as well as reducing product impurities, and the close monitoring of the operations improves overall manufacturing safety. Expenditures in this realm generally fall outside corporate IS budgets, but they are substantial both in dollar value and in strategic importance to these firms.

Although relatively small compared with the general administrative and factory automation applications, the area of testing and developing new products is a critical one at several of these firms. Here, computer resources are applied to generating new formulas for metal mixtures as well as to developing faster and higher-yield manufacturing processes.

Just as computers are playing a growing role in getting better metal products quickly out the factory door, so they are increasingly called upon to manage the ordering and supply of the products to a worldwide customer base. These customers are much more concerned with the quality and availability of the product than with its company or country of origin, and the producers that can meet customer demands for volume shipments on short order gain a tremendous competitive advantage. As part of responding quickly to orders, metal companies monitor and supervise the status of their shipments around the world. Again like the oil producers, the metal firms have a strong vested interest in delivering their commodity efficiently, and they expend considerable computer resources ensuring that their supply networks function smoothly.

METAL & METAL PRODUCTS
CASE STUDY

IS Has Nerves of Steel

At big steel's Armco Inc., IS helped make the difference between near bankruptcy and profitability.

BY TOM McCUSKER

Information systems have played a vital role in the return to profitability of Armco Inc., the Middleton, Ohio, steel company that four years ago was a month away from declaring bankruptcy. "We've lost $3 billion," says William Monteith, Armco corporate director of information resources management.

But in the last two years, Armco has been reporting profits again after a restructuring and divestment program that in three years has taken the company from a $7 billion a year organization to one making $3 billion a year. Along the way, it has been making "very extensive" investments in the manufacturing arena. Monteith won't disclose exact figures, but he indicates that "every single president of our customer companies declares that information is a desperate need in his company's future." He adds that at some customer installations 50% of capital investment is in information systems, and it "shows signs of going higher."

Although it has not yet adopted full-blown, ore-to-steel computer integrated manufacturing, Armco has installed computer-based integrated manufacturing programs to improve productivity and quality. It has adopted just-in-time philosophies and concepts and methods to automate manufacturing resource planning. "We go into these programs promising productivity improvements of from 20% to 50%," says Monteith, "and improvements in yields of 10% to 15%. In a recent installation, a 12% increase in yields was observed within a month."

Monteith thinks the company's biggest improvement could be produced by the application of artificial intelligence to complex problems. He says "six or eight" expert systems projects are under way. Most are secret, but Monteith says a project to simplify the way Armco's steel products are ordered should yield the largest payoff. Because of the complicated ways that Armco steel products are processed, in any given month the company will sell to three major automobile manufacturers and three appliance manufacturers a total of 21,000 different kinds of coil steel.

"We spend a lot of time trying to reduce the number of these products, but it involves the expertise of several hundred people and different metallurgy and chemistry," explains Monteith. He believes the harnessing of this kind of expertise could reduce the complexity in ordering and thus the high number of products.

Work on these innovations and the almost insatiable demand by Armco's manufacturing managers for information products have been pushing IS spending levels up by 7% to 10% a year—to almost $70 million this year. Spending should continue that way, says Monteith, until it reaches a point where expenditures begin to exceed what the company considers to be a normal percentage of sales. Armco's current budget probably exceeds that $70 million mark when you consider the proliferation of microcomputers within the company's various divisions, used in such applications as process control, communications, and data processing. Monteith admits he doesn't have a handle on how much money Armco spends for microcomputing: "We wish we knew how much this amounted to, but we don't."

Armco's IS operation is counting on CIM and AI.

Photograph by William Strode/Four By Five

Gushers of Information

Without IS, the oil business would dry up. Supercomputers help find the black gold, and computers also make possible its recovery, shipment, refining, and delivery.

Although the petroleum and petrochemical leaders spend less than the national average on information systems, their aggregate revenues lead all other sectors. In 1987, they invested 1.3% of revenues totaling $295.5 billion, or $3.8 billion, in IS operations. At the same time, industry profits dipped sharply, but almost solely because of Texaco's $4.4 billion losses. This had only a small, dampening effect on computer and communications purchases this year (even at Texaco), and most of the companies predict a steady growth in their IS budgets for next year. The trend is reflected in a shift of 1988 allocations: these companies will devote a larger share of their budgets to hardware than they did during 1987.

The oil producers are the only companies rivaling the industrial and automotive firms in their love affair with supercomputers. Seismic processing and modeling have a venerable history in the supercomputer field, and with good reason. The computational requirements of analyzing data from seismic recordings and test-well samples could bring mere mainframe computers to their knees. Through the judicious sampling of seismic readings and core data at select sites, geologists use the supercomputers to generate detailed maps of underground strata formations and oil reserves.

This industry was also one of the first to benefit from the application of artificial intelligence to its probems. An early expert system called Prospector employed geological knowledge and the rules of thumb that geologists apply to interpret data from oil well logs. The system helped discover an extension of a known molybdenum deposit in Washington State. Given the high costs of oil and mineral exploration, many of the leading firms in this sector have their own expert system development programs; with them, they hope to automate and replicate the knowledge held by a precious few industry geologists.

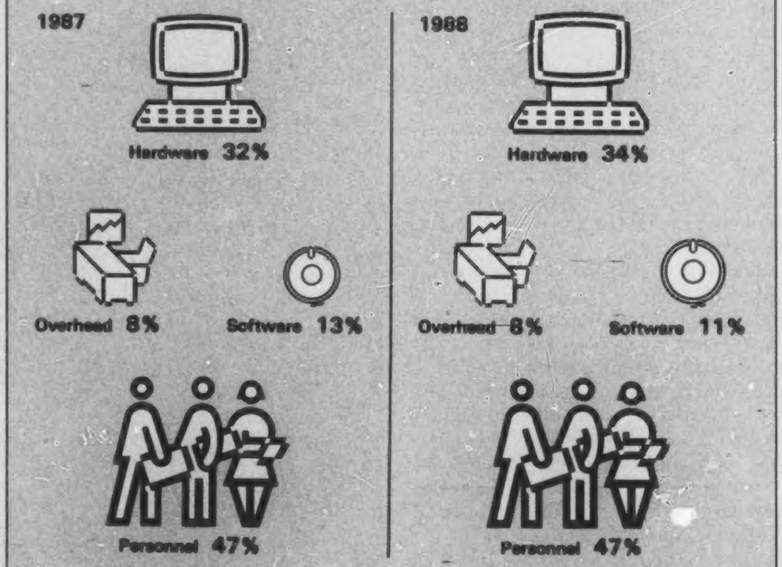
The Top 10

COMPANY	IS INTENSITY	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
Exxon Corp.	–	83,300	4,800	12/31
Mobil Corp.	=	56,716	1,258	12/31
Texaco Inc.	=	35,315	(4,407)	12/31
Chevron Corp.	+	28,106	1,007	12/31
Amoco Corp.	=	22,388	1,360	12/31
Atlantic Rich. Corp.	=	17,608	1,224	12/31
Occidental Petroleum Corp.	–	17,096	240	12/31
Tenneco Inc.	+	14,790	(218)	12/31
Phillips Petroleum Co.	=	10,917	35	12/31
Sun Co. Inc.	–	9,4[illegible]8	348	12/31

*= means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; – means less. Parentheses represent losses.
Source: DATAMATION

Distribution of IS Funds by Percent

Oil producers rival the industrial and automotive firms in their love affair with supercomputers.



Source: DATAMATION

Once oil is found, its recovery, shipment, and refining all call computer systems into play. Oil movement is a worldwide scheduling dilemma: computers track tanker positions and status in addition to oil well productivity and pipeline flows. The refining process itself is a constant customer for computer supervision and control.

On the sales side, the petroleum companies manage huge dealer networks. Here, shipment of product must be coordinated with individual service station demands. The stations themselves are also becoming very automated, and a substantial proportion of some of the oil companies' information systems budgets are directed at this local level.

Many service stations are now equipped with point-of-sale terminals that are linked directly to regional distribution centers. Data from the stations can thus be analyzed quickly for such information as changing consumer demand and individual station performance.

Most companies in this sector view their IS operations as important strategic resources with which to improve the search for oil and to manage more effectively its processing and distribution. And, although their percentage of revenues falls slightly below the average, this can be attributed in part to the relatively high expenses the petroleum and petrochemical firms encounter in the other areas of their day-to-day business operations.

PETROLEUM
CASE STUDY

Arco Ties IS to Inflation

At Atlantic Richfield, a lean IS operation helps the corporation stay on top of costs, keeping the head count down.

BY TOM McCUSKER

Like all other enterprises in the tumultuous petroleum industry, information systems still is considered an expense that should be trimmed. Three years ago at Atlantic Richfield Corp., Los Angeles, the trimming took place. The IS budget was cut 30%, down to $235 million from $340 million. Since then, IS budget increases have been tied to inflation, accounting for this year's modest IS investment of $240 million. Still, Atlantic Richfield makes judicious, if not expensive, use of information systems in the day-to-day running of its nine operating divisions.

"The turmoil in oil pricing makes us extremely cost-conscious," observes Allen N. Smith, manager of corporate information services. Asked how Atlantic Richfield's IS strategies reflect this priority, Smith notes that the company implements systems aimed at keeping the head count down.

When pricing fluctuations began to hit Atlantic Richfield's bottom line, the company decided to eliminate gasoline credit cards, instead offering discounts at its 1,750 stations in the western U.S. Now, it is investigating the use of debit cards and has pilot systems at a number of stations to further automate the delivery of gasoline and other services. Among the schemes currently operating are night-and-day minimarkets, which operate at 630 of the company gasoline stations.

The 1988 budget of $240 million, which includes expenses and depreciation of equipment, is based on the expense and service levels planned by IS operations in each of the company's operating companies, all of which follow the same inflation-rate guidelines. Corporate information systems people, says Smith, maintain a constant dialogue with their users to understand their business needs and to try to implement new technologies. For example, Atlantic Richfield is also beginning to use imaging technology to capture engineering documents for refinery operations.

Smith says Atlantic Richfield makes extensive use of artificial intelligence in its various operations. "So much is going on that I couldn't start to point out any special project," Smith asserts. Expert systems are being applied in the petroleum exploration activity and to analyze chemical spills. They're also being used in business areas, he says. Atlantic Richfield uses an expert system to assist it in formulating its long-range plan. "In reality, it didn't have much effect on the outcome of the plan, but it was a great exercise in getting the rules down and then codifying what we were doing to arrive at the plan."

Atlantic Richfield uses AI in operations from exploration to long-range planning.

Photograph by Arthur D'Arazien/The Image Bank

Going with The Flow

The IS budgets at process industries are a shade below average, but much of the computing—monitoring and control systems—may show up on manufacturing budgets.

Process industries increased their IS expenditures slightly in 1987, although their 1.7% of revenues placed them a bit below the national average. Still, at this rate, the aggregate IS budget of the top 10 corporations in the sector totaled $1.9 billion, out of revenues of $112.4 billion. As in some other industry sectors, such as petroleum and petrochemicals, the below average percentage of revenues devoted to IS doesn't reflect the critical importance of computing. The IS departments at these firms perform vital work in virtually every aspect of the business, from tabulating marketing surveys to controlling production lines to facilitating research activities. The costs of running these systems are reflected in higher 1988 allocations for hardware and overhead, and slightly lower spending on personnel and software.

The most obvious computer application in this sector is the monitoring and control of complex production lines. Process plants face unique manufacturing problems that traditionally have been more difficult to automate than those of factory floors dealing with discrete components and products. The industry is largely analog in nature, and requires the interfacing of devices such as flow meters and pressure and temperature gauges to digital computer programs.

Advanced automation systems in this business model the entire production process, producing detailed graphic displays that report the status of each stage of the operations. Analog dials can be simulated on the computer screens, and in some systems the actual analog controls can be reset remotely by altering the readings on the simulated controls.

Several of the process leaders, including Du Pont and Kodak, invest fairly heavily in computer systems for their research labs. As with the pharmaceutical firms, success at these companies is highly de-

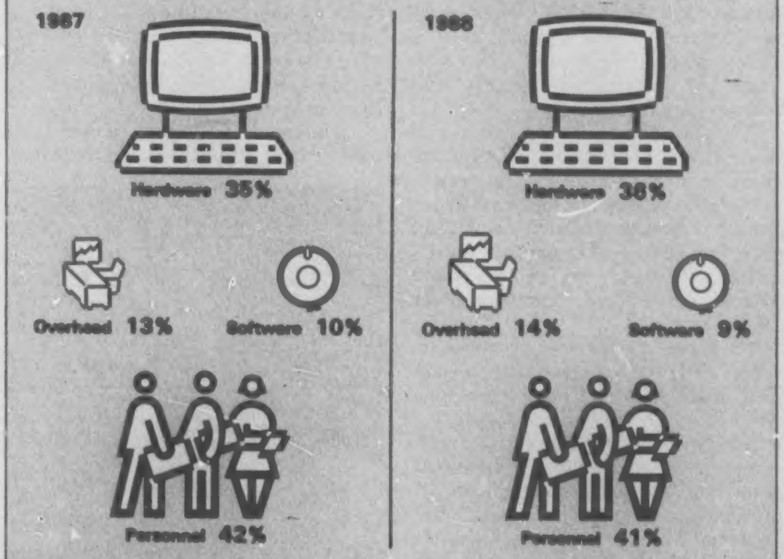
The Top 10

COMPANY	IS INTENSITY	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
E.I. du Pont de Nemours & Co.	=	30,468	1,786	12/31
Procter & Gamble Co.	=	17,163	327	6/30
Dow Chemical Co.	=	13,377	1,240	12/31
Eastman Kodak Co.	+	13,306	1,178	12/31
Georgia-Pacific Corp.	–	8,603	458	12/31
Monsanto Co.	+	7,639	436	12/31
Weyerhaeuser Co.	–	6,990	447	12/28
Union Carbide Corp.	=	6,914	232	12/31
American Cyanamid Co.	=	4,166	276	12/31
Boise Cascade Corp.	=	3,821	183	12/31

*= means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; – means less.
Source: DATAMATION

Distribution of IS Funds by Percent

The most obvious computer application in this sector is the monitoring and controlling of complex production lines.



Source: DATAMATION

pendent upon the development of new products and the improvement of old ones. These labs also improve the production processes themselves: slight reductions in waste or improvements in yields can produce substantial savings.

Although many of the administrative tasks at these companies can be addressed by off-the-shelf software packages, the process industry's unique operations require the development of numerous custom applications. As a result, a growing percentage of the IS budgets at the top 10 goes toward the acquisition of computer-aided software engineering (CASE) systems that help boost programmer productivity and hold down personnel costs. CASE systems are especially useful in adapting existing software to changing conditions, permitting the retention of core program instructions upon which necessary modifications can be built.

The task of cataloguing data about product lines—they number in the thousands at companies such as Procter & Gamble— consumes a major portion of processing power. Tracking production at far-flung manufacturing plants, managing inventories, and scheduling shipments requires close integration between departmental minicomputers and corporate mainframes. Controlling the manufacture and distribution of specific product lot numbers is especially important in many cases. Whether they are consumer or industrial products, many have limited useful lifetimes and must be produced in quantities that closely mirror immediate demand.

PROCESS INDUSTRIES
CASE STUDY

IS is Order of Day at Dow

At Dow Chemical, IS is building an order system that promises to improve both the quality and delivery of its products.

BY TOM McCUSKER

Advances in computer power and communications technology are enabling large organizations to detect and handle competitive pressures with a decisiveness and thoroughness that weren't possible as recently as half a decade ago.

Take Dow Chemical Co., the $15 billion Midland, Ohio, chemicals giant, which two years ago began to recognize that competition in its market was heating up. With sales climbing 2% to 3% a year, the company saw the need "to differentiate ourselves from other chemical companies," explains Hans Huppertz, Dow's director of information systems and communications services.

"We sensed that we had to be a little better than the competition to get the business, and that meant an improvement in both the quality and delivery of our products," he adds. "We felt that this had to be done by revamping the way Dow operated our customer service centers and to modernize our order entry and order processing systems."

Dow's information systems operation was handed the job of revamping the company order entry and order processing systems, which were using 15-year-old technology. The project, begun two years ago and not expected to be operational until 1990, is aimed at integrating order processing, which had been done separately and locally at plant sites. Huppertz is reluctant to discuss the cost of the project, but notes that it involves the acquisition of new software both from outside the company as well as from within, and a full-time development staff. In another large project, IS has provided telecommunications support for Dow's consolidation of customer service centers into a central operation at company headquarters.

This year, Dow is spending $275 million for its information systems activity, an increase over last year's expenditure of $264 million. Huppertz says that as information systems gain more stature in the company, the budget will be growing from 3% to 5% a year well into the future. "Top management has been giving IS more recognition, but it's more pronounced now," says Don Rockwell, manager of special projects on Huppertz's staff.

Spending at Dow is determined by a three-year plan that is constantly reviewed by a management group. IS builds the plan based on budgets that are drawn up and submitted to Huppertz's group by all of the company's manufacturing locations. Hardware and software acquisitions are not considered part of the IS expenses; they are considered part of Dow's capital budget and accounted for 6% of its capital spending in 1987.

Dow's IS budget grows 3% to 5% a year.

Photograph by Gary Gladstone/The Image Bank

All of the company's spending for information systems and capital spending are tracked and managed by Huppertz's group. As more and more computing has been done departmentally, however, Huppertz guesses that some spending escapes IS's attention, amounting to perhaps 5% to 6% of Dow's total IS spending. But, as he observes, everything has to be depreciated, and his department won't track depreciation unless it has installed the equipment.

Huppertz says that computing costs assigned to process control in Dow's plants are treated separately from IS. "We interface only by moving information in these sections," Huppertz explains.

New techniques for efficient storage of paper remains a priority among the Dow IS group that tracks new technologies. It is now in the midst of looking for storage guidelines for new forms of archiving that will improve efficiency.

Nevertheless, the company sees increasing use of unattended operations, especially for departmental systems such as IBM's new AS/400, and at its major data centers. It is Dow's long-range goal to run these areas with the only operator being the console operator.

Stocking Up On Information

In retail, the computer's presence is obvious in point-of-sale terminals and credit card transactions. Behind the scenes, IS helps ensure the apple is fresh and the hemline up to date.

As in last year's industry by industry survey, retailers continue to lag behind other industries in budgeted IS expenditures. Collectively, the leading U.S. department store and supermarket chains contributed just 0.4% of their $167.5 billion in 1987 revenues to IS operations, resulting in an aggregate budget of $670 million. Retailers spend a higher proportion of their IS budget on hardware than do companies in most of the other sectors. During 1988, they show a marked decrease from 1987 in their budget for personnel. Although this saving is slightly offset by budgeted increases in overhead, these companies appear to be striving for improved efficiency.

Nevertheless, most companies in this sector expect a gradualrise in their IS budgets, partly due to the cost of new technologies and partly to keep pace with rising computer personnel salaries. Applications programmers are in particularly short supply in this sector. Although some retailers are increasing their reliance on canned software for their administrative, inventory, and financial needs, most still customize at least part of the packages to better fit specific application demands.

Differences still remain between the department store chains and the supermarkets, most notably in the former's reliance on credit card sales. This often requires the linking of card reading equipment to verification networks maintained by the card issuers, and devoting considerable in-house computer time to processing these transactions. Supermarkets, on the other hand, are increasingly dependent on bar code reading, point-of-sale terminals. As well as permitting more rapid and more accurate servicing of customers, these systems can be tied into each corporation's product ordering and warehousing operations.

Some chains are experimenting with computer-based videotex systems to expand customer support services with-

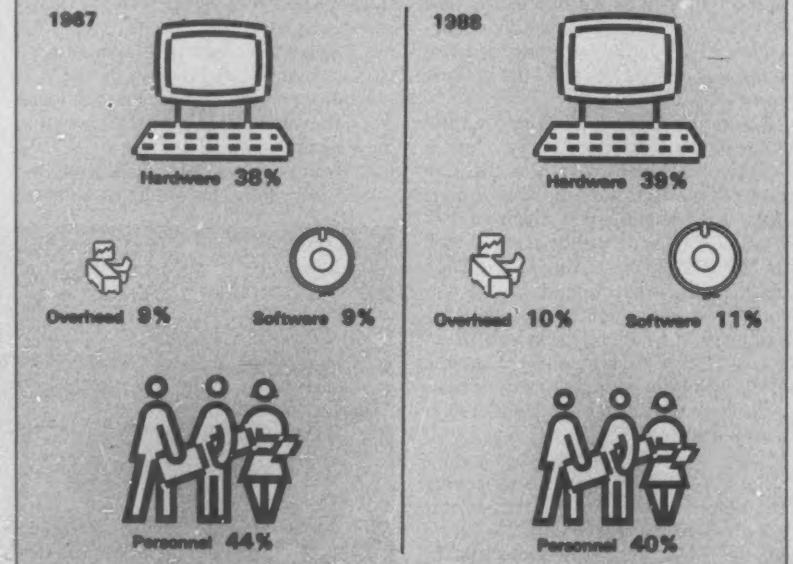
The Top 10

COMPANY	IS INTENSITY	REVENUE ($ MIL.)	PROFIT ($ MIL.)	FY END
Sears, Roebuck & Co.	+	48,440	1,649	12/31
K Mart Corp.	+	25,627	692	1/27
The Kroger Co.	=	17,660	247	12/31
J.C. Penney Co. Inc.	+	15,333	608	12/31
American Stores Co.	=	14,272	154	12/31
Federated Dept. Stores Inc.	=	11,117	313	2/1
Dayton Hudson Corp.	+	10,677	258	2/1
The May Dept. Stores Inc.	=	10,314	444	12/31
F.W. Woolworth Co.	=	7,134	251	12/31
Lucky Stores Inc.	=	6,925	152	12/31

* = means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; – means less.
Source: DATAMATION

Distribution of IS Funds by Percent

Retailers spend a higher proportion of their IS budgets on hardware than do companies in most of the other sectors.



Source: DATAMATION

out adding to personnel costs. Often equipped with self-explanatory touch screens, the videotex units contain information on merchandise locations, current sales programs, and product features. The stores hope such systems may also stimulate sales of featured products, but many question the potential of videotex to reduce appreciably the desire of customers to interact directly with salespeople.

Retailers are also starting to play catch-up in the use of satellite communications facilities. As the voice and data traffic of supermarket department store chains increases, many are exploring the cost savings and efficiencies to be gained through satellite communications. The capability to transmit information from corporate headquarters simultaneously to multiple store sites across the country is particularly attractive in this sector.

Inventory management and control is a major operational aspect of department stores and supermarkets alike. The type of retail store influences the nature of inventory warehousing and shipments, with lower-margin, faster-turnover mass merchandise chains requiring more computational support with their inventories than the higher-margin, more stable lines in department stores. Of course, supermarkets are especially dependent upon inventory tracking and product shipment, since so many of their goods are perishable. To cut losses from product shortages or oversupplies, supermarkets look to on-line communications with their suppliers to ensure a steady flow of products and to keep their shelves fully stocked.

RETAIL
CASE STUDY

Lucky Returns to Roots

Information systems at Lucky Stores aims at using technology to enhance stockholders' return on investment.

BY TOM MCCUSKER

Lucky Stores Inc. of Dublin, Calif., once a high-flying retailing conglomerate, has returned to its core business—a big supermarket chain with 350 stores in California, emphasizing quick in-and-out shopping at low prices.

Lucky once ran a chain of general merchandising discount stores, an auto parts chain, and assorted food-related operations throughout the U.S. In 1986, it began to sell off operations to fight an unfriendly takeover attempt by a group led by New York investor Asher Edelman. As of December 1987, Lucky had unloaded five companies and was back to the grocery business.

But there's more to the story. Earlier this year, it was acquired for $2.5 billion by American Stores Co. If the acquisition receives final approval, American Stores' Alpha Beta supermarket chain of 247 stores in California will be merged with the 350-store Lucky chain. The existing information systems operation at Lucky would serve the combined operation. According to Don Hillery, Lucky's data center director in Dublin, the job of the service would be straightforward: to use technology to enhance stockholders' return on investment.

Hillery's data center provides computing power for the company's remaining four divisions in a sort of centralized/decentralized IS organization. Two years ago, the IS function was decentralized. In the restructuring that enabled the company to stave off Edelman's takeover attempt, the company essentially centralized computing power in Dublin. The data center that Hillery runs provides the computer power and networking services, while applications development is performed by a Dublin-based IS operation.

This year, all but $10 million of Lucky's $40 million IS spending will be for the data center and the information systems function. The rest will cover hardware and development work done at Lucky's four divisions in northern and southern California. Each of these divisions, with its own vice president of data processing, essentially sets its own priorities for use of central development services and computing power at Dublin.

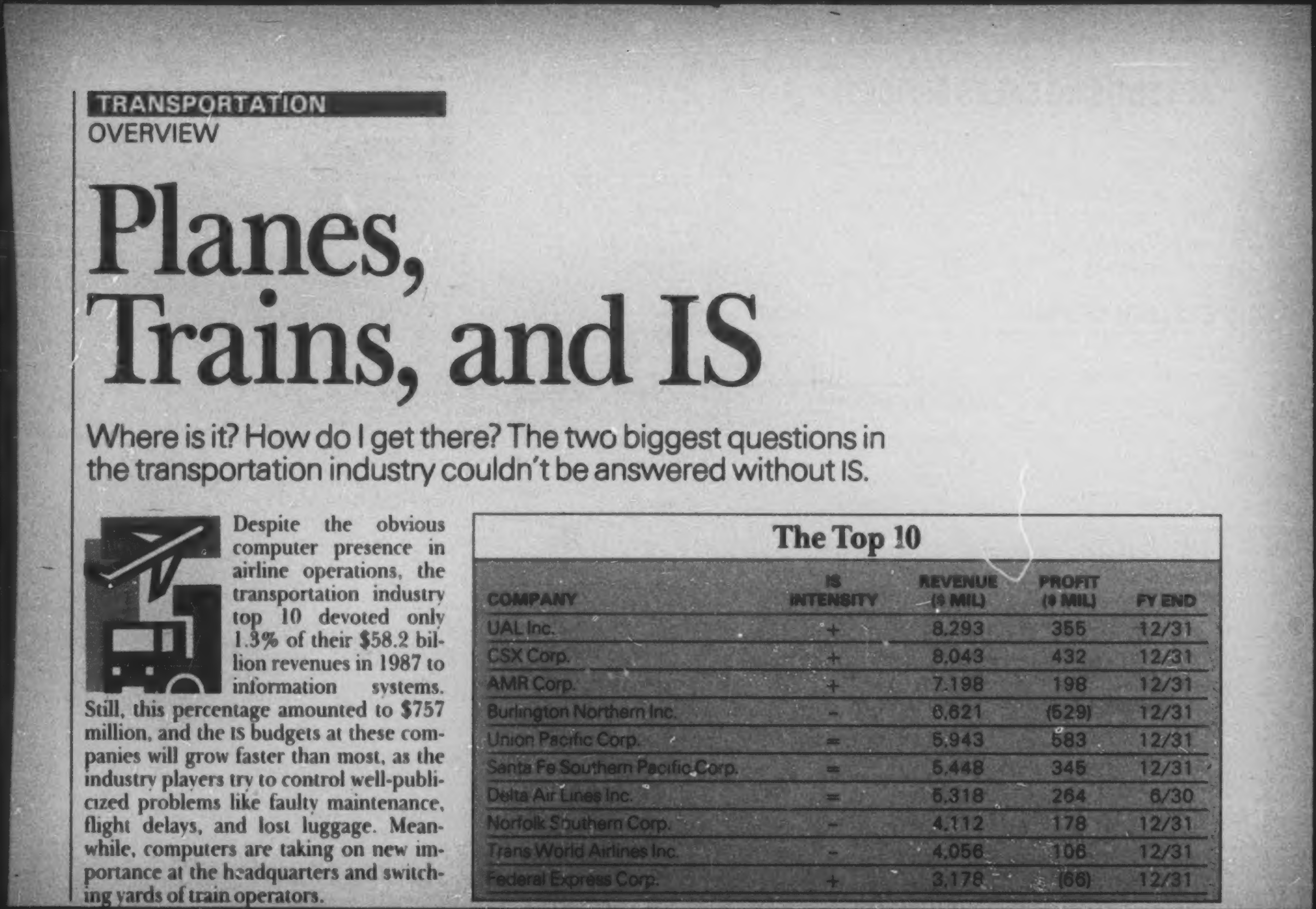
While these divisions pay for their local work, they also are billed by Dublin on the basis of cpu use. That's a change, says Hillery, from previous practices where customers were billed according to number of hours connected to the data center. "Now, these customers learn to optimize their cpu usage and have developed knowledge of techniques such as determining whether DASD or tape storage should be used in particular cases," he asserts.

The overall information systems budget is based on history as well as estimates from Lucky's various user divisions, Hillery explains. "We ask them in the budgeting process what their requirements are for the coming year, the level of computer support they'll need, and what they expect to want in applications development."

The company's current emphasis is on expert systems to help stores better meet the needs of customers. "In the old days, we adopted a single store format and replicated it 100 times. Today, stores are run differently according to the neighborhoods they serve," says Hillery.

Lucky Stores runs a combination centralized/decentralized information systems operation.

Photograph by Ben Mitchell/The Image Bank



TRANSPORTATION
OVERVIEW

Planes, Trains, and IS

Where is it? How do I get there? The two biggest questions in the transportation industry couldn't be answered without IS.

Despite the obvious computer presence in airline operations, the transportation industry top 10 devoted only 1.3% of their $58.2 billion revenues in 1987 to information systems. Still, this percentage amounted to $757 million, and the IS budgets at these companies will grow faster than most, as the industry players try to control well-publicized problems like faulty maintenance, flight delays, and lost luggage. Meanwhile, computers are taking on new importance at the headquarters and switching yards of train operators.

The Top 10

COMPANY	IS INTENSITY	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
UAL Inc.	+	8,293	355	12/31
CSX Corp.	+	8,043	432	12/31
AMR Corp.	+	7,198	198	12/31
Burlington Northern Inc.	–	6,621	(529)	12/31
Union Pacific Corp.	=	5,943	583	12/31
Santa Fe Southern Pacific Corp.	=	5,448	345	12/31
Delta Air Lines Inc.	=	5,318	264	6/30
Norfolk Southern Corp.	–	4,112	178	12/31
Trans World Airlines Inc.	–	4,056	106	12/31
Federal Express Corp.	+	3,178	(66)	12/31

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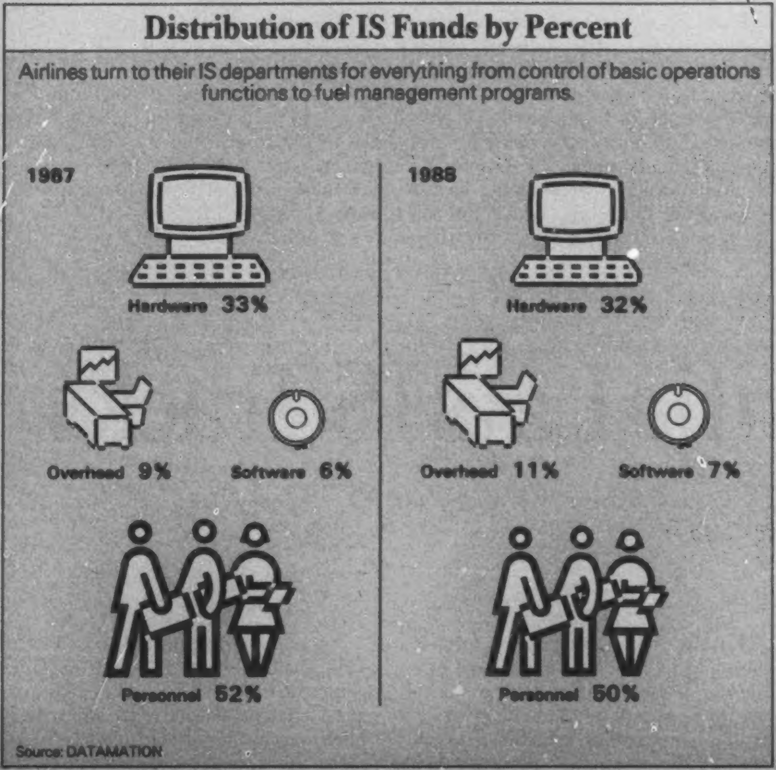

Distribution of IS Funds by Percent

Airlines turn to their IS departments for everything from control of basic operations functions to fuel management programs.

Source: DATAMATION

Computer-based reservation systems remain the mainstay of the airline industry, and these worldwide networks are constantly being upgraded and modified. American Airlines' SABRE (Semi-Automated Business Reservation Environment) system, for example, is adding electronic mail and office automation functions to its repertoire. American is trying to get its 14,000 SABRE subscribers to trade in their old networked terminals for IBM Personal System/2 workstations, which can run the new programs locally. By pushing the idea of PS/2 workstations within the agencies, American is establishing the basis for future system enhancements that will run on the systems.

Government surveys over the past year confirm what air travelers have known for some time: the on-time performance of most airlines has been steadily declining. The new Federal Aviation Administration policy of reporting comparative performance figures for the airlines has resulted in the intensification of computer-based efforts to better manage plane scheduling—for flight departure and arrival as well as for maintenance. The airlines are also attempting to become more efficient internally, cutting costs by turning to their IS departments for everything from control of basic operations to fuel management programs. The need for this emphasis is shown in 1988 budget increases for overhead relative to 1987; meanwhile,

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hardware spending has fallen slightly.

The frequent flyer programs maintained by the airlines also consume a healhty share of transportation computer resources. The travel activity of club members is tracked and tabulated, and periodic statements are generated to apprise members of their accumulated mileage and travel bonus options.

Long the also-rans to airlines in computer usage, the railroads are now upgrading their corporate IS operations, finding new areas in which to apply computer technology. These firms place a premium on maintaining detailed information about equipment locations, train movements, and traffic patterns. Trains must be coordinated with the arrivals and departures of container ships, and cargo progress tracked. In addition, on-board automated train control systems are now in developmental stages. These automated solutions will further distribute the task of operating the trains and should improve train efficiency and safety.

When it comes to tracking the location and status of its charges, though, none of the airline or train companies can compare with Federal Express. The job of scheduling pickups and deliveries of overnight packages has intensified as competition in the field has grown. Fed Ex took a loss in 1987, but it still devoted a higher percentage of its $3.2 billion in revenues to IS than the rest of the big 10 transportation companies.

TRANSPORTATION
CASE STUDY

Union Pacific Lays IS Tracks

At the venerable railroad giant, IS builds systems that stop and start trains, prevent collisions, and save big money.

BY TOM McCUSKER

The railroad operations of Union Pacific Corp. have been around for 170 years, providing rail transportation in the western three quarters of the nation, and, through right-of-way holdings, providing huge sources of tax revenues to federal, state, and local governments. Railroads also are recognized as dangerous operations, particularly at railroad crossings. For years, railroads have been operated as highly labor-intensive services.

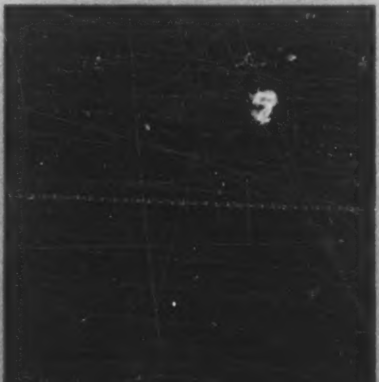
It was relatively easy for the company's information systems to facilitate the handling of multiple revenues reports to various tax departments at all levels of government, as well as to render the reports certifying that the company meets safety requirements.

However, it is in applying information technology to reduce labor-intensive work in its transportation operations that the real challenges exist, says Guerdon Sines, vice president of information and communications systems.

That's the problem the company is now attacking. First, it is using computer control to dispatch trains electronically in railroad yards. It is bringing in microcomputers on locomotives that read transponder data from the rails. These enable locomotive odometers to be tracked automatically to within one tenth of a mile by people who monitor safety. The system advises engineers of deviations from preset speed limitations; and can take control of the locomotives from the engineers and shut them down, says Sines.

This contributes to safety and leads to savings in fuel. For example, on single rails where trains running in opposite directions must pull off onto sidings in order to pass each other, speeds can now be controlled so that both trains reach their sidings at the same time and neither has to stop. Much of the way this new technology works, says Sines, is analogous to the way planes navigate electronically.

To enhance its competitiveness with other modes of transportation, Union Pacific uses its networks to provide electronic data interchange for ordering, billing, and paying of invoices, and also has been encouraging its customers to tie the railroad's facilities into their just-in-time manufacturing schedules. Sines says that most JIT systems are tied to motor carriers rather than to the railroads, but he foresees a greater linkage in the future.


Union Pacific uses IS to dispatch trains.

Photograph by G.M. Smith/The Image Bank

Union Pacific's budget process closely follows long-range systems plans that extend out by five years. The plans, of course, are changed yearly as priorities are given to projects that have the closest relation to the firm's overall strategies. Users consult with Sines' information systems group in planning their projects, and a committee of three senior vice presidents give the projects their final stamp of approval. "While I don't approve expenditures, all spending must have my endorsement," Sines explains.

This year, Union Pacific is spending $110 million in information systems for the railroad, virtually the same sum as in 1987. Its spending five years out actually could decline, says Sines, but then, "at any time, our budget can be squeezed or expanded as we envision cogent rates of return." It has some leeway, too: this year, information systems spending represents only 3% of total capital spending of $650 million. In such organizations, people begin worrying when the figures start to hover around 7%.

Sines looks to imaging technology as an attractive new method for Union Pacific to handle accounts payable. While many customers handle such systems electronically, vast numbers still send written messages—or images—which Union Pacific then will enter into the system as an image.

Calling All Computers

Maintaining up-to-date data on millions of customers makes the utilities big users of information systems. The leaders make do with near-average IS budgets.

AT&T and its offspring dominate the leadership ranks of the utility companies, with only two other firms—the phone-oriented GTE and the Southern California Edison electric utility—making it into top 10 spots. As a group, the utilities spent 2% of their $126.3 billion 1987 revenues on corporate information systems. This translated into an aggregate information systems budget of $2.5 billion for the year. However, since for the most part the telephone companies' computer-based switching systems and transmission facilities fall outside of the corporate IS budgets, actual industry expenditures on processing equipment are considerably larger than indicated in the IS budgets.

As these companies prepare for competition in their markets and for new trends in regulation (price cap versus rate of return), their 1988 budget allocations show important cuts in overhead and personnel items. It is important to keep these costs low in competitive markets.

The phone companies have devoted considerable expense to upgrading their customer billing systems. Although much of the call data collection equipment is an off-budget expense, the disk drives that store these data and the mainframe computers that process them into bills represent a sizable portion of the IS operations at telephone utilities.

The billing focus is equally important at Southern California Edison and the other electric utilities that didn't quite make the top 10 listing. Although the metered billing at the electric companies is more straightforward than that for the varied-service phone companies, producing hundreds of thousands of monthly statements is no trivial task.

The immense size of these firms requires the maintenance of extensive records on thousands of employees. Because of the information-intensive nature of the

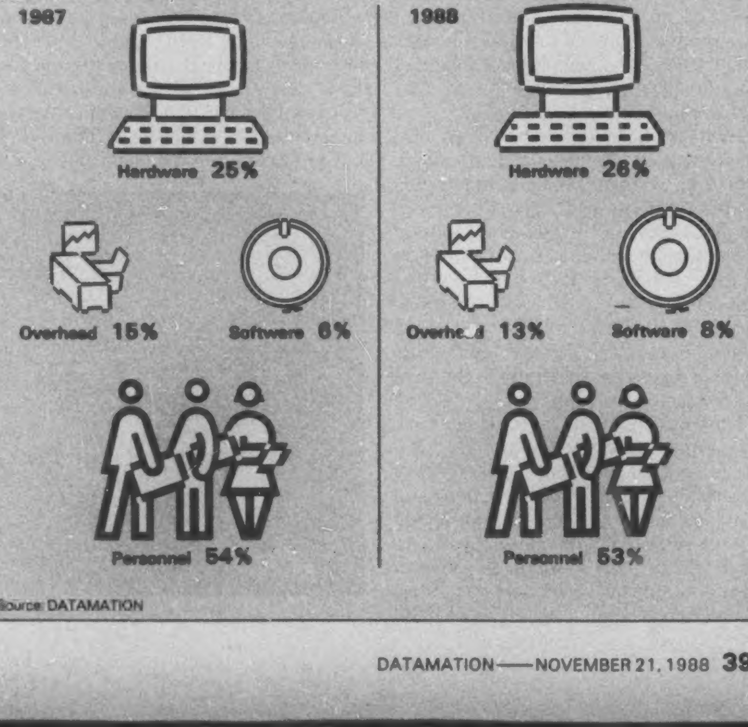
The Top 10

COMPANY	IS INTENSITY	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
AT&T Co.	+	33,598	2,044	12/31
GTE Corp.	=	15,421	1,119	12/31
Bell Atlantic Corp.	=	12,298	1,240	12/31
BellSouth Corp.	+	12,269	1,665	12/31
Nynex Corp.	=	12,084	1,227	12/31
Ameritech Corp.	+	9,536	1,188	12/31
Pacific Telesis Group	=	9,131	950	12/31
U.S. West Corp.	=	8,445	1,006	12/31
Southwestern Bell Telephone Co.	−	8,003	1,041	12/31
Southern Calif. Edison Co.	=	5,493	789	12/31

*= means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; – means less.
Source: DATAMATION

Distribution of IS Funds by Percent

Increased competition has forced cuts in overhead and in personnel allocations.



Source: DATAMATION

industry, a high percentage of these employees require desktop personal computers and workstations. As a result, the utilities represent a fertile market for office automation technologies. This is one area where, in many cases, existing software for applications such as electronic mail can be purchased and installed without modification.

Appropriately, the phone network operators are also major purchasers of local area computer networks, by which means they connect departments and employees to one another and to shared disk, printing, and communications bank facilities.

The lifeblood of these companies is the supply and maintenace of universal service in their given territories, and their IS departments are under constant pressure to improve the speed and efficiency of providing that service. Substantial resources are devoted to managing incoming orders to disconnect old phone lines and connect new ones. The relatively recent options to add features such as call forwarding and call waiting have added to the complexity of this process, with increasing numbers of customers requesting service changes. Many areas see a seasonal peak in such activity in August and September with returning student populations and turnovers in rental apartment occupants. A certain amount of overcapacity must be built into the IS department computers to handle these crunch periods.

UTILITIES
CASE STUDY

Switching to a Party Line

This huge communications utility is simplifying a complex mix of systems, aiming at corporatewide commonality.

BY TOM McCUSKER

Ameritech Corp. of Chicago is an amalgamation of five independent Bell operating companies in five states, each with different applications architectures—a situation that the company says it is rushing to change.

The problem will require large amounts of money and considerable time to solve. It is aggravated by a perceived need within the organization to react more quickly to customers' needs with more cohesive information systems, says Todd Glenn, vice president of information services with Illinois Bell, Chicago. (Illinois Bell and telephone companies from Michigan, Indiana, Ohio, and Wisconsin comprise the Ameritech utility.)

With nine data centers, 650 employees in information systems, and $220 million invested in computer systems, Illinois Bell is one of Ameritech's larger units. Its annual IS budget of $100 million is a third of the total $300 million to be spent for IS at Ameritech this year. Its first implementation of a common system was the installation this year of a carrier access billing system. Illinois Bell was selected first because it represents a hefty 15% chunk of the company's revenues.

Early next year, all five companies will have a common payroll system and toward the end of 1989 will install a message processing system that will be common to all the companies. A common information system—essentially a single-service method to bill customers—will be implemented at the companies over a three- to four-year period, beginning at the end of 1989.

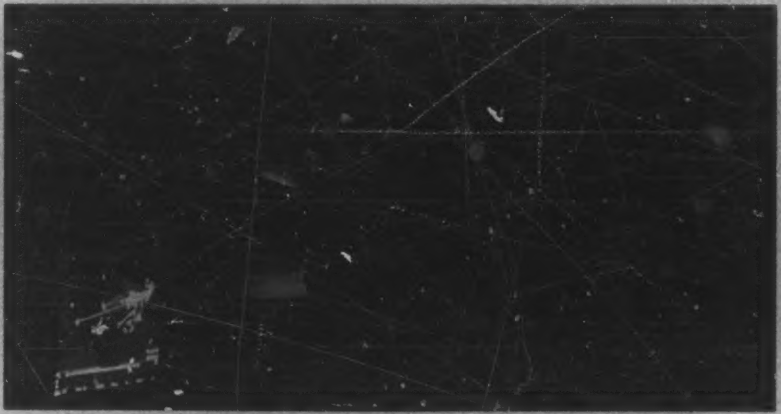
In its drive for a more cohesive information systems organization, Ameritech last month launched a facilities management organization, Ameritech Applied Technologies, to serve as a support system for all of the company's operations. During the six months since it was organized, AAT has absorbed much of the computer power and computer people from the company's five telephone companies. Its first function will be to act as an IS support system for customer service ordering, and billing.

AMERITECH

Glenn says IS spending starts when Ameritech units establish net income commitments for review by management. What the units must spend to achieve these net income commitments, such as for IS, are examined against an existing five-year IS budget that, when necessary, is then revised up or down. At Illinois Bell, the $100 million to be spent this year is about 8% higher than in 1987.

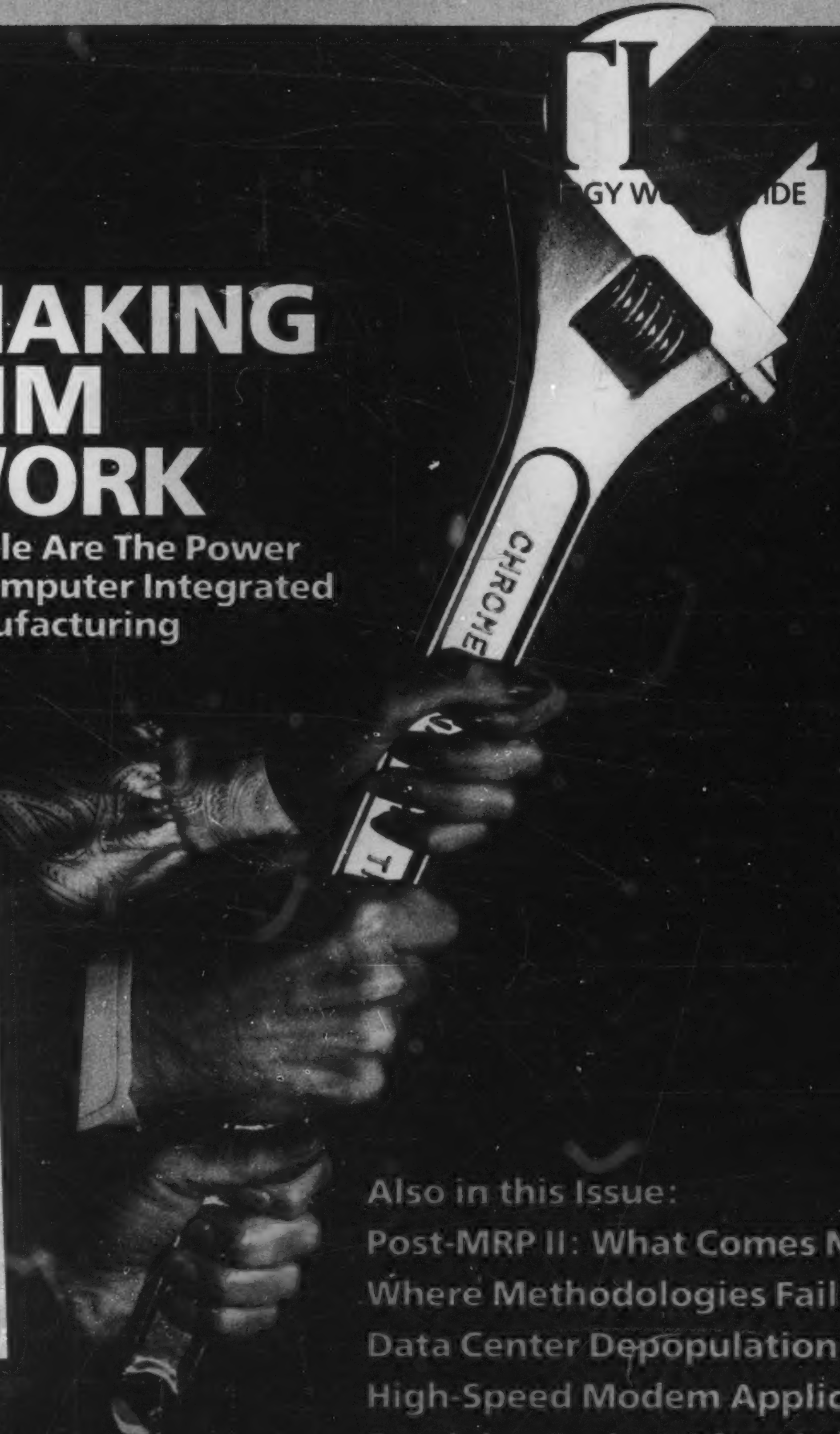
Looking forward through 1992, Glenn expects IS spending to rise each year as the company launches additional projects to achieve commonality, but with the reorganization and the establishment of Ameritech Applied Technologies, he says he's unable to conjure a firm number.

More and more, Glenn observes, customer departments within Ameritech are demanding a greater say in the way their IS systems are set up and run. For example, they wanted access to a centralized source of more sophisticated applications until a fire outside of Chicago last May crippled telephone communications. "Now they want redundancy," Glenn says. He adds that customers rarely demand new technologies, but rather new functions. "We use new technology to deliver that functionality."



Ameritech has 650 IS workers and about $220 million invested in computer systems.

Photograph by Al Satterwhite/The Image Bank



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DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

Making CIM Work 18

BY WILLIE SCHATZ Investments in computer-aided manufacturing are soaring as companies rush to compete globally. This year U.S. companies invested $52 billion in CIM. But successful CIM users report that returns on CIM dollars depend more on the people implementing automation efforts than on the technology itself. Says one CIM user, "You're not just changing your computer configuration, you're changing your methodology. You're changing the way you do business."

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BY JANET RUHL If you're designing a complex system for professionals, be prepared for post-implementation aftershock. Once users learn their way around the system, they will test its limits, setting off shock waves that could devastate an otherwise successful project. But if IS takes steps to prepare itself, post-implementation aftershock need not be fatal.

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INTERNATIONAL

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BY RUSSELL PIPE The world's telecom policymakers are thrashing out rules for who should control value-added network services.

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BY PAUL TATE A DATAMATION/Price Waterhouse survey shows that while many European users don't expect the pan-European standardization of 1992 to affect their IS plans, many expect the European IS industry to change.

STRATEGY

Cassoni Shakes Olivetti: Reorganization on the Way 7

BY JANETTE MARTIN Poor profit figures, product line problems, and power shifts have made Vittorio Cassoni heir apparent at the troubled Italian giant.

APPLICATIONS

Computing for Art's Sake 9

BY JANETTE MARTIN Michelangelo's frescoes, Leonardo's "The Last Supper," and the ancient city of Pompeii now rely on computers for their preservation. The imaging technologies used are attracting interest among commercial users.

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BY LAUREN MURPHY ICI Imagedata announces a new paper-based storage system; Memorex WORM for IBM mainframes.

INSIDE DATAMATION

The Schatz Factor

In this issue's cover story on CIM (page 19), Willie Schatz writes that a successful CIM strategy must be "of the people, by the people, and for the people. . . ." Successful magazines aren't very different. And of the people who contribute the most to DATAMATION'ssuccess, few can claim more credit than Willie Schatz. This issue's CIM story is an example of Schatz's skill at telling the stories that matter. Schatz gets the word on CIM from successful users—and, for comparison, tells why some failed to succeed in the past. He talks to vendors, consultants, and academics to fill out the story of this $50 billion-plus automation market.

For more than a decade Schatz has been writing for DATAMATION, first as a freelancer, more recently as Washington Bureau Chief covering government computing, the international technology trade, and, for the past several years, factory automation and supercomputers.

Schatz does more than cover these fields: he wins prizes for the way he covers them. He takes complex technology topics and strips them of pretension and pr hype. Few people in the U.S. know more about the supercomputer industry and the issues it involves than Schatz. In the last two years he has taken home two Neal Awards, the most coveted prizes in trade magazine publishing; and in the most recent Computer Press Association competition, he was cited for writing the Best News Story of the year for a story he broke about Japanese firms "dumping" supercomputers in the U.S.

Photograph by Kathryn Lambert

SCHATZ in a rare attitude of repose.

Away from the PC on which he writes, winning is also important to Schatz, particularly on the tennis court. While he is no stranger to 18-hour days when on a story, there always seems to be time for sports. Schatz is sports-crazed, both as witness and participant. At off-site editorial meetings when other DATAMATION editors are seeking solace from the day's first cups of coffee, Schatz is likely to be finishing his first set of tennis—*after* he's swum his laps—still managing to appear, on-time, for 8:30 a.m. meetings.

Schatz grew up on Long Island, New York, and after getting a law degree, he aimed himself at writing. His first professional writing jobs were—fittingly—covering sports, first freelance for the *Washington Star* and then full-time for the *Miami Herald*. But no matter where he lives or writes, Schatz's loyalties do not easily change: the New York home teams possess his apparently unswervable devotion.

Even more colorful in speech than in print, Schatz has been known to turn the air blue with invective when his high standards for journalism are not met. For the rest of us at DATAMATION, Willie Schatz's insistence on the best is one of the reasons this magazine can, after more than three decades in business, still stake a claim to the loftiest ideals in computer journalism.

—Parker Hodges, Managing Editor

DATAMATION

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MAKING

Investments in computer-aided manufacturing are soaring as companies rush to compete globally. But returns on CIM dollars depend more on the people implementing automation efforts than on technology.

BY WILLIE SCHATZ

If a company's computer-integrated manufacturing strategy isn't of the people, by the people, and for the people, there is little chance that it'll increase productivity, lower costs, add efficiency, or deliver any of the other promises associated with factory-floor technology investments.

"CIM is really a cultural change," says Bob Ratcliff, a lead analyst for CIM services at farm machinery maker Deere & Co., which has spent a lot of time working on how to manufacture tractors more efficiently using systems. "It's really a way of life. You're not just changing your computer configuration, you're changing your methodology. You're changing the way you do business. You're changing mind-sets."

Or, as Arthur Andersen & Co. says: simplify, automate, integrate. But that's far easier said than done. CIM doesn't happen overnight. Even when it's properly conceived, a strategy that automates a significant portion of a company's manufacturing operations takes years to implement. "A lot of people are going for the big win," comments Vincent Jones, author of *MAP/TOP Networking* (McGraw Hill Book Co., New York, 1988). "People are always in a rush. Management wants to see the whole problem solved today."

Manufacturing compa

ISSUES 88 This is another in a continuing series of articles addressing new management, organizational, and systems issues that confront IS.

CIM WORK

nies worldwide are pouring vast sums of money into automating their operations. Boston-based Harbor Research Inc. estimates CIM investments will nearly double to $91 billion in 1992 from this year's $52 billion, with transportation companies leading the way.

But before those investments produce the kinds of returns manufacturing executives and their IS counterparts are banking on, companies have to thoroughly examine the entire-manufacturing process. "Too many people automate [without thinking about what they're doing]," Jones asserts. "Step one is [for] the company to change its way of thinking. Understand the process, document the process, simplify the process, then automate. Automation is the last step, not the first."

Users agree. "CIM is a journey," says David Rea, director of the manufacturing systems division of Weyerhaeuser Information Systems Div., Tacoma, Wash. "It's a means to an end, not an end in itself. It's not something that you do in a year."

Or maybe even in a decade. Weyerhaeuser has been playing the CIM game since 1978. After an initial skirmish in 1978 and a second round in 1982—both of which were limited by the available technology—the company finally solved its CIM problem in July 1985 with an in-house system called ProSmart. ProSmart, a set of VAX-based software tools (including a database), furnishes real-time production information, as well as considerable savings. In fact, ProSmart has been so effective for Weyerhaeuser, saving more than $1 million annually at its Longview, Wash., pulp and paper mill, that the firm is marketing it commercially. "We made the tool rather than buy it, because we looked at the marketplace solutions and there weren't any [for us]," Rea says.

Today, manufacturers have a much broader choice of commercially available software to use as a base for their CIM efforts, especially in the MRP (material resource planning) II arena (see "Post MRP II: What Comes Next?" p. 24). "CIM programs are more readily available than five years ago," agrees Kreg Brown, vice president, Oriole Software, a CIM software manufacturer in Towson, Md. "Users are saying to vendors, 'Get me the functionality to do my job and we'll worry about the platform later. What software will give me the best benefit for my money? What will it take for me to get and stay competitive?' "

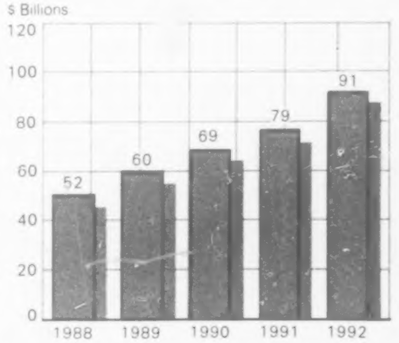
As with everything else in business, investment in manufacturing is driven by competitiveness. But competitiveness means different things for different industries, and that makes for a variety of CIM applications. So it's a question of how, not whether, companies gain a manufacturing advantage. Most still approach CIM with the chief objective of improving the quality of their plant processes and the products they manufacture, according to the 1988 North American Manufacturing Futures Survey conducted by the Boston University School of Management. Also among the top CIM goals of those companies surveyed is the speeding up of development and production, and increasing the flexibility of manufacturing operations.

But none of the companies surveyed are going anywhere in CIM without some serious soul-searching. "Companies have to break old habits so they can take advantage of the new environment," says Jeffrey Miller, professor of operations management at Boston University and director of the survey. "CIM is a process of discovering how to simplify the entire manufacturing process. The best firms aren't even doing MRP any more. Since MRP is really an IT reflection of the entire physical process, they've simplified the environment that MRP controls. A factory that MRP controls is automatically a better factory. It's a question of attacking root causes."

While some companies are able to identify manufacturing problems before they begin to hurt profits, others don't begin to seriously seek CIM solutions until their businesses begin to suffer—either due to external market conditions, internal inefficiencies, or a combination of both.

The Worldwide CIM Market

Manufacturing systems and software sales are projected to double.



Source: Harbor Research Corp.

The farm crisis, for example, motivated the $4.1 billion manufacturer Deere to plow into factory automation, albeit late. "We became real lethargic during the '70s," remarks Ratcliff, CIM analyst at Deere's tractor factory in Waterloo, Iowa. "For so long the attitude had been that whatever we did was right, and the marketplace reflected that. So we saw no reason to change it. We were Deere the institution, not Deere the business."

The severity and length of the downturn in U.S. agriculture in the early 1980s forced Deere to focus on its core business. Tractor production had dropped to as low as 10% of the previous level, resulting in layoffs, salary reductions, early retirements, and all the other signs of a business on the brink.

"We took a crash course in CIM," Deere chairman

Photograph by Peter Neumann/Charts by Catherine Francis

DEERE'S RATCLIFF: "CIM is really a cultural change."

Photograph by George Ceolla, Black Star

and CEO Robert Hanson said at the recent AUTOFACT conference in Chicago. "That's 'crash' as in when the bottom falls out. We were lucky in a perverse sort of way. Other companies see the drip-drip of slowly eroding market share and put off dealing with the inevitable. When you get hit like we did, you can't do that."

Many of the early retirees were succeeded by younger, more aggressive managers who were not afraid to confront Deere's problems. They formed the nucleus of a computer-integrated manufacturing task force, whose sweeping recommendations in 1986 included the formation of a CIM services group comprised of seven members from different quarters at Deere's Waterloo works. The chief suggestion of the task force, which emphasized the merits of decentralized operations, was that the plant's middle managers should find new ways to make their individual departments more productive. Implicit in the task force's thinking was the conviction that there was a need to reform the ways those plant managers obtained information.

"We were taking on a large, powerful centralized mainframe IBM IT shop," says Ratcliff, describing Waterloo's IS dependence on relatively meaningless data generated by IBM mainframes at Deere's headquarters in Moline, Ill. With the CIM initiatives, "we were going to have to redirect the emphasis on how to collect and manage data. Everything in dp was going to have to be by and for the end user, not the systems organization. We had to drive computer ownership, design, and use to the lowest possible level. That meant distributed, localized computing with a great deal of flexibility."

That also meant a totally different approach. "Any change means a fundamental and terrifying attitudinal adjustment," Hanson asserts, "but if your company's going to be competitive, it's got to change its corporate will so it has the gumption to make timely and difficult decisions. We changed not because we were forward looking, but because of the big [competitive] bang.

"Now we're not afraid of change, we can see the forest for the trees and now we know that in manufacturing integration you have to emphasize the people, not the technology. However dazzling the hardware, the 'software' between the ears must be updated first."

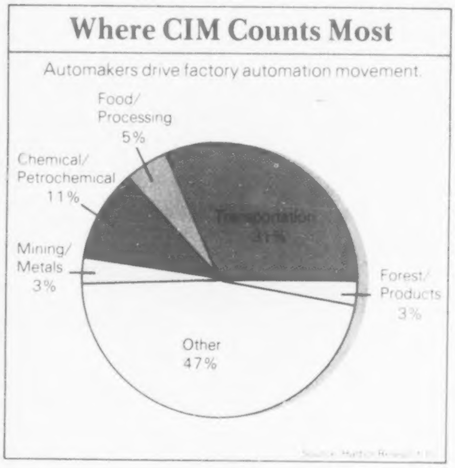
And that's not easy. Despite this absolutely top-level support, Deere's progress to date has been slow. "We've spent the last 15 months just getting to the point where some people are listening to us," Ratcliff says. "Classic CIM is our end goal, but a lot has to happen before we put in massive amounts of hardware . . . . The frustration comes because we want to run, not walk. But at least we're moving."

Rolling Out the CIM Carpet

Monsanto Chemical Co.'s journey down the CIM path was faster. Challenged by corporate management in 1984 to increase productivity by 50% in three years, the company's largest manufacturing plant responded by forming three "Plant of the '90s" operating committees that involved every department in the plant—accounting, data processing, research and development, engineering, finance, and operations. Management asked the committees to develop one CIM plan for the site, located on 2,000 acres in Pensacola, Fla., so the costs of implementing it could be factored into capital planning for the next decade.

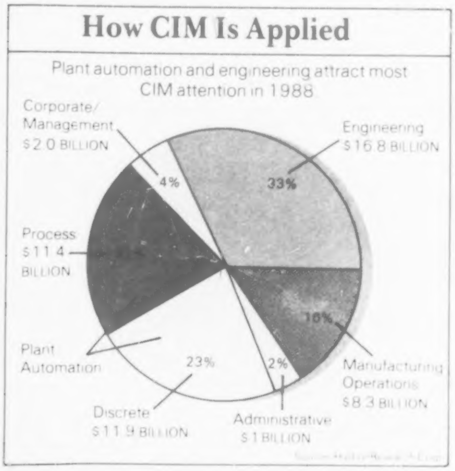
The committees generated 800 ideas for how to achieve productivity breakthroughs at the plant, which primarily makes nylon carpet yarn. Those ideas were eventually reduced to three key CIM projects, all of which are intended to improve access to systems by any of the plant's 2,500 employees:

- A local area network to integrate the plant's current IBM, DEC, and HP systems, including some 300 PCs. Monsanto so far has invested about $1 million in



Where CIM Counts Most

Automakers drive factory automation movement.



How CIM Is Applied

Plant automation and engineering attract most CIM attention in 1988

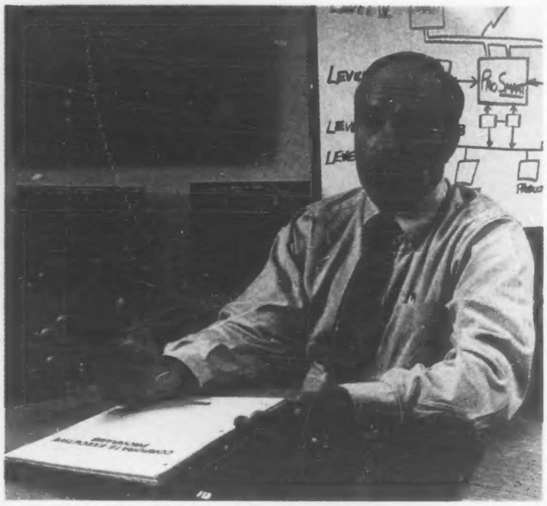
"CIM is not a panacea. It's just another manufacturing tool, a mechanical way of putting people 10 feet away from each other so they can communicate."

Ethernet- and broadband-based networks to do so.

- Separate database management systems for its yarn and chemical product lines. The company has decided to implement Oracle DBMS software as a result.
- A partnership with DEC and Fisher Controls to develop a prototype architecture and application for optimization of all resources at the site.

Monsanto Chemical's plant must be doing something right, because productivity has increased 47% as measured by a complex CIM formula that includes the following variables: raw materials, capital, energy, labor, supplies, and maintenance. Moreover, the company has already recouped some of its CIM investment costs, although the average payout is two or three years.

"The most important part is planning how you're going to be doing business in the '90s," declares Carol Holmes, supervisor of information and systems technology at the Monsanto plant. "Without that cross-functional, visionary plan, we wouldn't have done anything. There were no territorial turf wars and [there was] no jealousy from the dp group . . . [which was] not in a position to set priorities. Those have to be determined by the user groups. If we [had] waited for dp to do it, we'd still be waiting."



WEYERHAEUSER'S REA: "CIM is a journey."

Photograph by Doug Wilson/Black Star

So would Bentley Nevada, an industrial instrumentation maker in Minden, Nev. The company realized there had to be a better way to fly when an audit showed that it took 3,500 blueprints to produce one product—that's about three times too many—and the blueprints took about five times longer than they should have to translate into the product. Trying to get a product to market was like trying to swim through quicksand.

"We'd made a corporate decision that it [automation] was absolutely necessary for us to be competitive in the '90s," says Dave Biggs, Bentley's vice president of product development. "It was becoming pretty obvious that our information system wasn't going to cut it," he continues, referring to the company's $65 million hodgepodge of equipment and software that had been designed for specific functions but that was unable to work together.

"So we decided to analyze what information we really needed [for production]. We discovered that there were real good gains to be made by providing a manufacturing database [developed in-house] that could offer flexibility to other parts of the organization. We never set out to use CIM. We were just looking at improving our production process."

Committing to a Single, Unified Database

Bentley didn't start out with CIM, but by the time it had invested millions of dollars in Compaq 386s, AutoCAD, and CADNETIX software, it had certainly finished with it. The process was hardly painless. Bentley restricted its initial database investments to its engineering departments, which alienated other departments from the CIM cause and yielded little improvement to overall productivity. The company realized its mistake and made a commitment to create a single, unified database that would serve all departments, not just engineering.

"It's absolutely essential that you have one database," Biggs stresses. "If you've got multiple databases, it's a lock that one's wrong. We did an awful lot of grinding on each other until we got the system down. You've got to have an active methodology that promotes the involvement and coordination of all the parties concerned."

Database technology has also keyed Weyerhaeuser's success in CIM, although it experienced two failures in automating its 1,300-worker Longview factory before hitting on its ProSmart solution. "We missed the mark in '78 and '82 because we thought data was the problem," Weyerhaeuser manufacturing director Rea confesses. "With ProSmart we took a people-focused approach, not just a [technological] one. The main business driver was still global competitive pressure, just as [before]. But it was easier the third time because we took the lessons learned and carried them forward."

Unfortunately, a significant number of manufacturers aren't even experimenting enough with CIM to be learning any lessons from it. Many are reluctant to change their ways, especially when some plant capacities in the U.S. are approaching 85%. The old "if it ain't broke, don't fix it" philosophy could be a costly one, however. "Those who pay CIM lip service will continue to be less competitive," networking author Jones warns. "The Japanese don't pay CIM lip service, and they're beating the pants off [U.S. manufacturers].

"Sure CIM is a lot of work," Jones continues, "and it's not a panacea. It's just another manufacturing tool. But the essence of CIM is really very simple. It's a mechanical way of putting people 10 feet away from each other so they can communicate."

Post-MRP II: What Comes Next?

Except for MRP II, users find little packaged wisdom when automating manufacturing. As a result, the pioneers write most such software themselves. But packaged modules are gaining favor.

BY MARY JO FOLEY

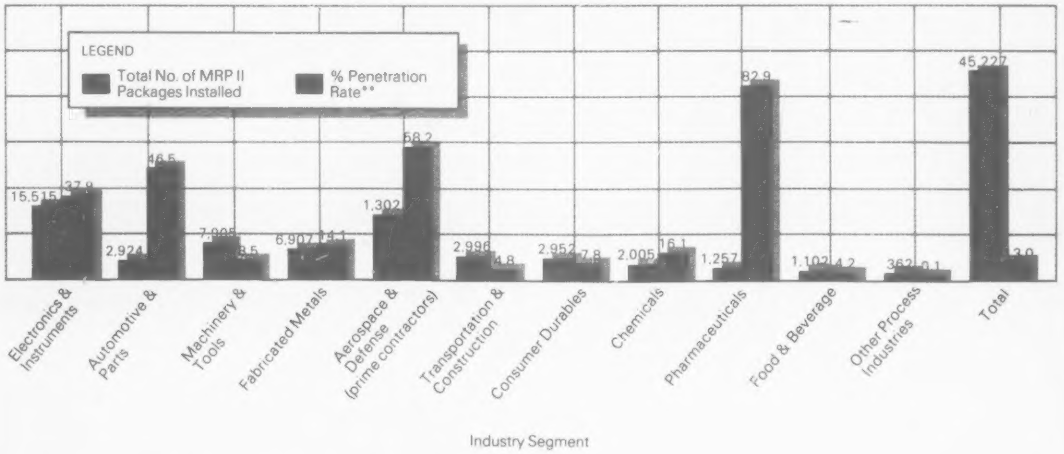
In the discrete manufacturing world, many users have come to equate computer-integrated manufacturing (CIM) with MRP II. However, as automation pioneers are discovering, areas such as quality control, cell control, scheduling, simulation, and maintenance are equally important pieces of the CIM puzzle. Yet, compared with the MRP II world, where packages for all types of users across all price ranges abound, these other segments are in their infancy in terms of the number of application packages available.

As a result, customers have been left to take an ad hoc approach to solving their total manufacturing software needs. Far and away, most are writing the software themselves or working with consultants and/or systems integrators to devise custom solutions. A growing number, however, are testing the market waters by purchasing third-party tools and applications and, in some cases, working directly with developers to tailor the interfaces on those packages to make them more applicable to their operations.

At least in the discrete manufacturing arena, MRP II is often the first type of system customers install. Currently, a sizable portion of U.S. discrete manufacturing companies have some type of packaged MRP II system up and running. (This is not true in the process industries, where MRP II has only recently begun to take hold. The pharmaceutical industry, with an estimated 83% penetration rate, is the only

Which U.S. Manufacturers Use MRP II*

Pharmaceutical firms (82.9%) lead all other segments in use of packaged Manufacturing Resource Planning II software.

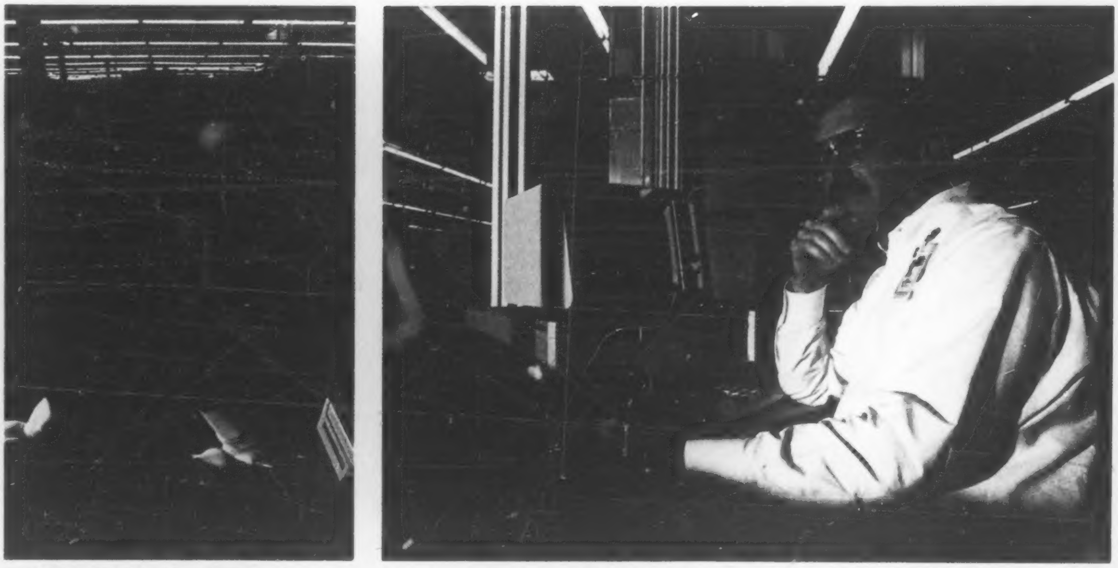


* Figures do not include systems developed in-house or extensively customized packaged systems.

** Penetration rate has been adjusted to reflect actual MRP II usage rather than merely vendor-installed base counts.

Source: Plant-Wide Research Corp.

Chart by Paragraphics



TEXAS INSTRUMENTS' LOTT: The flexible manufacturing system that runs TI's factory floor, seen at left, was developed from scratch.

Photographs by Jim Knowles

notable exception.) According to Plant-Wide Research Corp., a North Billerica, Mass.-based market research firm, MRP II penetration rates last year reached 58% among aerospace and defense contractors; 47% among automotive and related parts makers; and 38% among electronics and instruments firms (see "Which U.S. Manufacturers Use MRP II").

It's primarily when users endeavor to move beyond MRP II that they discover the gap between CIM talk and reality. Texas Instruments' Trinity Mills facility in Texas ended up developing its entire Flexible Manufacturing System (FMS) from scratch because of the dearth of off-the-shelf software.

Trinity Mills, a metal fabrication plant, is one of 14 facilities that comprise the company's Defense Systems and Electronics Group. According to the plant's automation manager, Vernon Lott, "third-party software absolutely wasn't available in the case of FMS" when TI first became interested in the concept three years ago. The job was expected to be especially complex because the facility employed factory-floor devices manufactured by so many different vendors that "it was more of a systems integration effort" than a pure software development one, Lott says.

TI already had spent more than five years developing its proprietary corporate-wide MRP II system. A 12-person development team spent a year planning and another year implementing its FMS system. Brought on-line in March 1987, it includes a scheduling system for production control, a cell-control system for coordination, and links between its computer-aided design (CAD) and machine-tool facilities, to name just a few of the modules.

Design time for the FMS was relatively short, thanks to the engineers' use of TI's artificial intelligence programming tools and Explorer Lisp machine in developing the scheduler portions of the system, Lott explains. In addition, he says, quite a bit of the cell-controller technology that TI had perfected at its neighboring Sherman defense facility was transferrable to Trinity Mills. Yet little, if any, of Trinity Mills' FMS is transferrable to other TI plants, since no two TI manufacturing facilities use all the same parts. In fact, another TI plant is running a third-party-developed FMS system, Lott notes.

Packages Gaining Ground

Few users are as thoroughly automated and integrated as TI. Rather, those discrete manufacturers looking to take the next CIM step are likely to add single modules, such as cell control, quality control, scheduling, simulation, process planning, and maintenance, one step at a time.

No two customers seem to agree which of these modules should be brought on-line first, but whatever module they choose, like TI, most are doing a lot of customization work themselves. According to market research firm Automation Research Corp., Medfield, Mass., two thirds of the money that users spend on manufacturing software (including MRP II) is still going for in-house development and/or custom-built software. Among process industries, the amount that users spend on custom software is nearly 80% of their total CIM software expenditures.

Packaged modules other than MRP II have a low level of penetration in manufacturing markets primarily because "the number of commercial packages available is really low," says Alice Greene, president of Plant-Wide Research. "Companies are ending up having to modify them greatly," she adds. In some cases, such as the factory-floor maintenance market, "vendors are pushing the market more than the users." Consequently, maintenance packages are written to reflect a utopia where production and maintenance people work together, although Greene points out that this isn't usually the case within most factories.

It is also because few users have the massive muscle and know-how of a TI that they increasingly are looking at third-party services and products. For instance, when power-supply manufacturer Zytec Corp., Eden Prairie, Minn., called in a consultant for advice on choosing an MRP II system in 1984, the Control Data Corp. spin-off ended up opting for a Xerox Corp. system running on an IBM 4361 mainframe. "The system is doing a half-decent job, but it is limited in terms of tying it into our information system," says

Zytec's systems engineering manager, Damon Whitmore.

Manufacturing Users' Wish List

Cell control, simulation, and scheduling top expected software buys.

Application Type*	1987 User Expenditures ($ Millions)	1992 User Expenditures ($ Millions)	AAGR** %
Cell control	16.4	82.2	38.1
Quality control	20.0	33.7	9.9
Scheduling	34.5	117.3	27.8
Simulation	25.6	90.7	28.7
Process planning	18.7	34.8	25.6
Maintenance	352.6	447.6	13.3

*Data is for packaged systems employed by discrete manufacturing companies only.
**AAGR–Average Annual Growth Rate
Source: Automation Research Corp.

When it came time to select other CIM components and processes, Zytec evaluated whether it should go the one vendor route or work with multiple systems integrators. "Even though we knew we would have to do a lot of work in between [linking various vendors' offerings], we decided to contract with several different vendors to create our CIM plan [known in-house as ZYCIM]," says Whitmore, chief architect of ZYCIM. Mainly, this was due to the fact that "there isn't a single vendor that currently can do everything from IS to factory floor, on PCs through mainframes," Whitmore says.

Whitmore is gathering bids from various third-party vendors for the next step in implementing ZYCIM: the development of an electronic link from the company's Cadnetix CAD system to its Hewlett-Packard Co. in-circuit tester. (So far, it has received quotes from Cadnetix and HP.) After Zytec puts its link in place, Whitmore says, it will focus on acquiring an analog-design simulation package for its design engineers. "We're not going to sit here and do any major software development," Whitmore notes. "All of the tools and knowledge already are available to carry us into the 1990s."

Along with Zytec, computer maker Digital Equipment Corp., one of the foremost U.S. manufacturing experts, seemingly shares the view that many existing CIM tools and applications are sophisticated enough to meet users' needs. At its Chelmsford, Mass.-based Corporate Center for Excellence for Simulation and Modeling, DEC operates a simulation lab for training and development work. The lab runs "most of the [process simulation] software on the market," claims Chris Kuhner, manager of manufacturing expert systems.

"Simulation tools that were available not too long ago required a mathematician to build models," Kuhner continues. "The user interfaces, especially, were extremely unfriendly." As of 1982, DEC had trained only six in-house users in process simulation techniques. "We basically did nothing in the way of simulation. Instead, we used to go out and build plants, and make mistakes." Today, however, "simulation is used in every one of the more than 40 [DEC] manufacturing sites by more than 300 users companywide," he boasts.

DEC relies on simulation tools that were developed by the West Lafayette, Ind.-based Pritsker & Associates, but customized to DEC's specifications. Six years ago DEC linked up with Pritsker to help develop user interfaces that were more applicable to discrete manufacturing operations. Developing these types of fine-tuned, complex software applications is extremely expensive, even for a company the size of DEC, Kuhner says. "We know we can't be all things to all people. To beat this limitation, we partner with third-party developers."

Despite a successful development effort, neither Pritsker's simulation tools nor other off-the-shelf simulation tools offer links between simulation and CAD, Kuhner says. Most such tools also would benefit from improved analytic (especially financial analysis) capabilities, he adds.

"Today, we're seeing great shortening of product life cycles and tighter cost ranges. Product is well controlled," with software like MRP II, "but process [manufacturing] isn't," since companies aren't fully utilizing other manufacturing software, Kuhner asserts.

Mary Jo Foley is a freelance business and technology writer based in Washington, D.C.

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Users Expect Fewer Vendors And Lower Costs

A DATAMATION/Price Waterhouse survey shows that while many European users don't expect the pan-European standardization of 1992 to affect their IS plans, many expect the European IS industry to change.

BY PAUL TATE

On Dec. 31, 1992, Europe will become a unified market, free of internal trade and tariff barriers, and linked together by an expanding web of electronic trading links. At least that's the plan of the European Commission in Brussels, which represents 12 of Europe's major countries.

With an estimated GNP of over $4 trillion and a population of 320 million people, a single Europe would be one of the largest industrialized markets in the world, strongly supported by established economies and an infrastructure of internal trading links. Observers believe that many of the new trading links forged in preparation for 1992 will be electronic. Multinational network services, electronic data interchange (EDI) systems, and messaging, inquiry, and transaction networks will create a trading environment that will sustain the future European economy. This will be the foundation of a European "open system" for trade and commerce.

The Influence of 1992 on IS Purchasing

French and German companies most expect their buying choices of key products to be influenced by emerging European standards in the next four years.

	Operating Systems	Packages	Database Systems	Software Dev. Tools	Suppliers
(by percent)	%	%	%	%	%
FRANCE	72	72	28	50	56
GERMANY	100	13	67	27	7
U.K.	29	32	19	20	24

Source: DATAMATION/Price Waterhouse.

Yet some European IS managers, who are supposed to be key to creating this new Europe, are still approaching the 1992 deadline with skepticism and in a state of poor preparation.

A DATAMATION/Price Waterhouse pilot survey of 90 European IS managers in West Germany, the U.K., and France canvassed their attitudes on the 1992 transition, and found that three quarters of U.K. users and a third of French and German users expect 1992 to be a "nonevent" in IS terms for their companies.

Although some expect to make formal IS plans for 1992 in the next four years, a large number—half of U.K. and West German users—believe that such plans are unnecessary. Over 80% of U.K. and West German users do not even expect the new rules to delay the development of their key systems.

They do feel, however, that the IS industry in Europe will change, and that that change will be to their benefit. IS executives in all three countries predict a reduction in the number of IS suppliers. Also, over 90% of users expect 1992 to be good for them because they expect prices to drop due to the economies of scale or reductions in tariffs. They also expect that standardization will help reduce the complexity of their choices.

In fact, the proposed European standards, covering a range of technical, trading, and legal issues in many industry sectors, are already influencing the purchasing plans of these IS executives. The results show a likely boost for Unix and the OSI networking standards, which reflects the need for Europeans to use standard interfaces to overcome both supplier and national network incompatibilities.

French users stand out in the survey as being particularly conscious of the significance of 1992, partly because of the French government's extensive awareness campaigns. Most expect their IS choices to be influenced in all areas surveyed except database systems, and the vast majority have, or expect to make, formal IS plans geared to the 1992 deadline over the next few years. There is clear evidence that these plans will require considerable software changes for French users. Unlike U.K. and West German IS executives, most French users expect their choice of software packages to be strongly influenced by European standards.

These kinds of recent market shifts at both a national and European level, combined with the urge to benefit from pan-European economies of scale in manufacturing and distribution, are sending IS vendors in Europe into a frenzy of strategic mergers and acquisitions, as exemplified by Nokia's takeover of Ericsson Information Systems and the merger of U.K. services companies Systems Designers and Scicon. U.S. companies such as IBM and Digital Equipment Corp., meanwhile, are embarking on aggressive marketing drives to promote their systems integration products and services, as well as their willingness to work with other companies in major deals.

But perhaps the most ambitious 1992-inspired union thus far is between 22 European telephone authorities. Next month, in an unprecedented move, they will launch a new joint company called Managed Data Network Services (MDNS), which will provide a pan-European one-stop shop for managed network services. Based in the Netherlands, MDNS will develop and sell cross-border leased lines along with network management services. Based on X.25 protocols and linking each national packet switched network, the new service is expected to boost OSI standards in Europe.

In the meanwhile, network users, whether they are industrial firms or network providers such as GEISCO, should find that the costs of value-added services and some intra-European networking will be greatly reduced.

It would seem that in the key network services sector at least, the survey respondents may start reaping the benefits of 1992-induced price reductions somewhat earlier than they may have anticipated.

Sector Performance Update: Spotlight on Industry

Good news dominates reports from three industrial sectors: electronics, industrial, and metals.

BY MADELINE FRANCHI

In the electronics sector, growth in 1988 was the best since 1984. Renewed equipment investment by business, increased opportunities for exports, and the upward momentum of the business cycle propelled electronics industry growth this year. To keep pace with the influx of new orders, electronic manufacturers have expanded their output levels about 8% so far in 1988. Electronics sales climbed almost 11% through July compared with the same period last year. Shipments are forecast to total $258 billion this year, compared with $212 billion in 1984.

For many companies, this rebound has meant a return to increased profitability. For IS in the electronics sector, the news potentially translates into more dollars for staff and equipment. During 1988, the electronic and electrical machinery industry invested roughly $18.2 billion in new plants and equipment, which represents a 19% hike over the spending rate in 1987.

The industrial machinery and automotive sector is also doing well. Nonelectrical machinery sales were up about 16% compared with 1987. This increase encompasses factory shipments of general industrial, farm, and construction machinery.

A big boost is the booming export market. In order to increase capacity to meet the demand, machinery makers invested roughly $15 billion this year in new plants and manufacturing equipment.

The domestic auto industry is benefiting from less import competition due to the weaker dollar. In the first seven months of the year, domestic auto sales rose 8% above sales for the same period last year. Sales of light trucks continue to boom. Through July of this year, sales of class I and class II trucks were 9.6% higher than a year ago. At this pace, year-end sales are expected to advance 8.6% to nearly 4.7 million units, making 1988 the fifth consecutive year of record-breaking growth in truck sales.

However, don't look for the auto manufacturers to put any extra dollars into their equipment budgets right now. They spent billions in 1984 and 1985, so growth in their capital spending will be squeezed for some time to come. The industry's expenditures for new plants and equipment are expected to shrink about 5% in 1988 compared to a year ago.

Metal products are also rebounding. Industrial production of fabricated metal products expanded 10% from August 1987 to August 1988, and more gains are expected. The combined forces of a declining U.S. dollar and strong foreign economies produced a strong demand for U.S. capital goods, including forgings, stampings, and structural metal products.

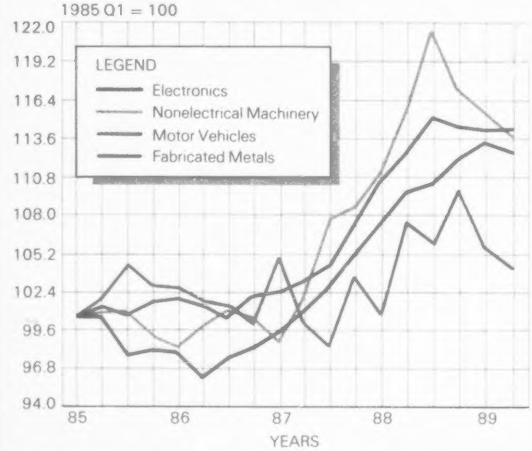
Capacity utilization in this industry hit 84.4% in August, the highest monthly rate since October 1979. Metal manufacturers are now investing in new plants and equipment to keep their factories and information processing needs running smoothly. If spending continues as expected, this industry will have sunk about $4.4 billion into capital stock this year.

Once each quarter, Information Economics will report on the health of various U.S. economic sectors. Future issues will cover the action in food and beverage, pharmaceuticals, petroleum and petrochemicals, process industries, retail, utilities, banking, insurance, health care, transportation, and government.

More economic information can be obtained from Cahners Economics Department, 275 Washington St., Newton, MA 02158, (617) 964-3030.

Industrial Production Index

The sharp updraft in production is coming to an end: 1989 numbers may approach late-'87 levels.



Source: Federal Reserve Board and Cahners Economics

Economic Spotlight Tidbits

Gauge your industry's health by following these economic indicators (in $ billions).

	Actual 1987	Forecast 1988
Electronics*		
Shipments	$235	$258
Average capacity utilization	75.4%	77.4%
Plant/Equip. spending	$16.6	$18.2
Nonelectronic machinery**		
Shipments	$156	$180
Average capacity utilization	74.5%	80.0%
Plant/Equip. spending	$13.9	$15.0
Motor vehicles		
Auto shipments (millions/units)	7.1	7.6
Average capacity utilization	79.2%	80.3%
Plant/Equip. spending	$11.9	$11.3
Fabricated Metals		
Shipments	$135	$144
Average capacity utilization	78.2%	83.1%
Plant/Equip. spending	$4.0	$4.4

*Includes computers and office equipment, tv and radio, communications equipment, electronic components, and scientific and engineering instruments

**Excludes computer and office equipment shipments

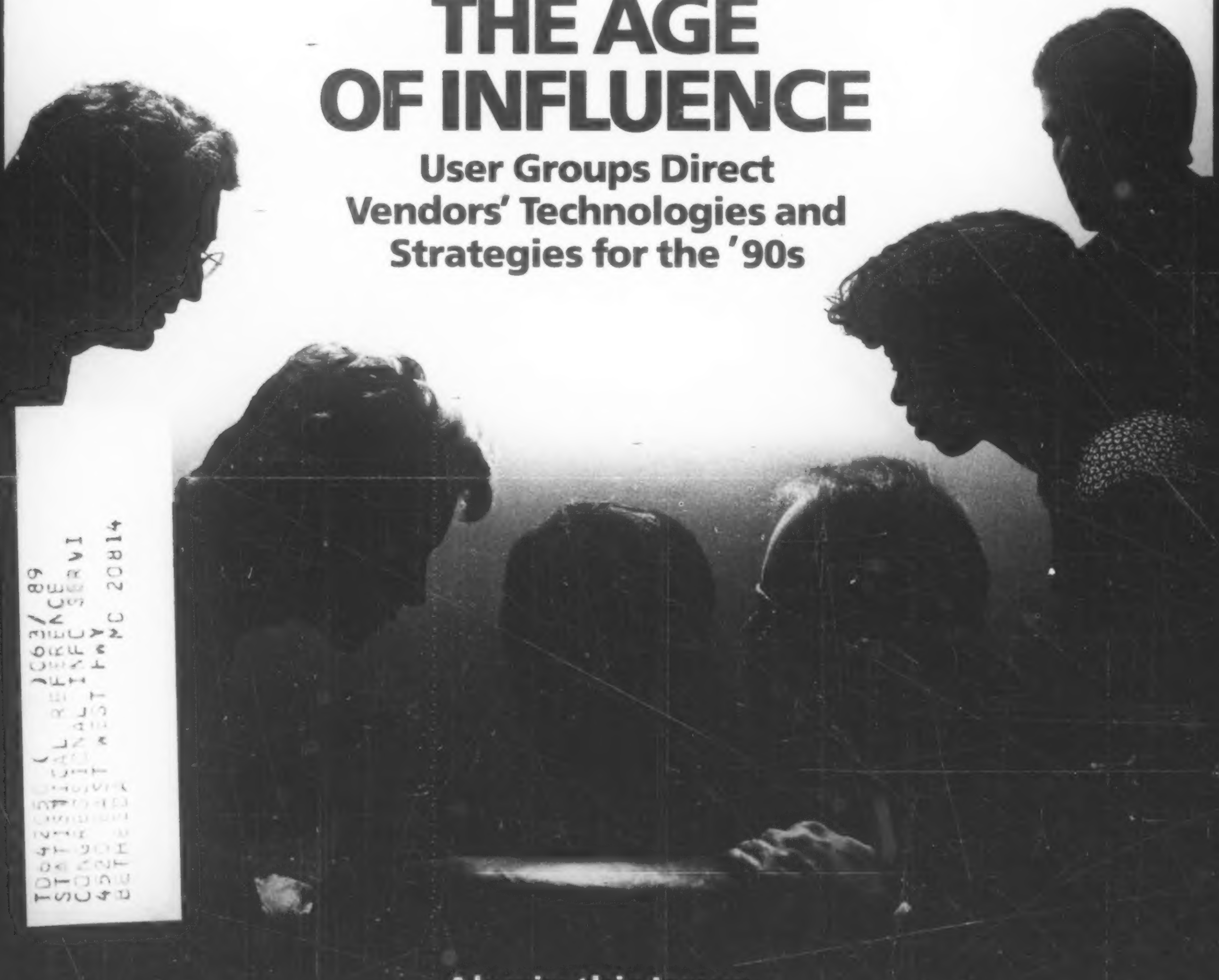
Source: Commerce Dept., Federal Reserve, Motor Vehicle Mfrs. Assn., Cahners Econ.

A CAHNERS PUBLICATION
DECEMBER 15, 1988

SPECIAL REPORT: Annual International User Group Directory

DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE



THE AGE OF INFLUENCE

User Groups Direct Vendors' Technologies and Strategies for the '90s

TD642505 (JC63/ 89
STATISTICAL REFERENCE
CONGRESSIONAL INF SERVI
4520 EAST WEST HWY
BETHESDA MD 20814

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Semantic DBMSs Advance on AI Heels
PC Back-Up Moves to the Optical Era
It's Do Or Die for SWIFT II
Why Comp Sci Grads Can't Add

DEC 15, 1988

VOLUME 34
NUMBER 25

DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

The Age of Influence 18

BY KURT ROTHSCHILD Once hardware-oriented and concerned mainly with information exchange, user groups now take aggressive roles in the formulation of vendor policy and product development. A customer phenomenon that does not exist in any other known industry, these user groups are a force to be reckoned with. Many of the older, hardware-based groups have adopted a distinct software consciousness, and hundreds of software-oriented organizations have emerged.

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Cover Photography by Roberto Brosan

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A Matter of Semantics 51

BY DANIEL R. O'CONNELL As advances are made in computer technology and AI-based software, more attention is being given to semantic DBMSs. Although they're not yet commercially available, get ready, they're coming.

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PC Back-Up Moves to Optical Era 57

BY BOB FRANCIS New erasable optical storage devices, along with existing WORM drives, offer sound alternatives to magnetic tape drives for backup.

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It's Do or Die for SWIFT II Project 72

BY RAYMOND BOULT Next month, banks and finance firms worldwide will hear if SWIFT II, their delay-ridden $40 million project to develop a better global messaging network, will be scrapped.

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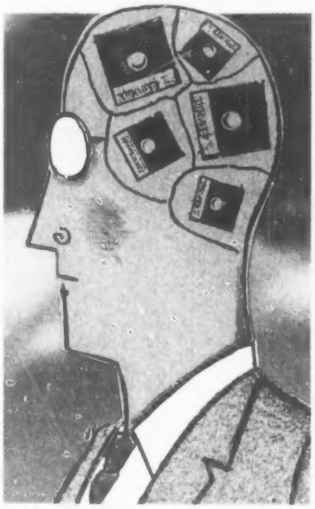
Curriculum Shortfall 77

BY MICHAEL RIDGWAY Computer science curricula fall short of the business world reality, producing graduates who are unprepared to do maintenance, and who lack essential communications skills.



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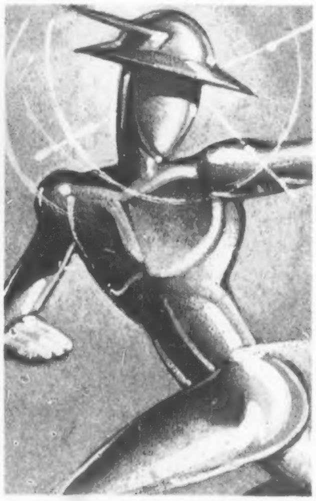

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INSIDE DATAMATION

Eager Users and Enabling Technology

What began as a modest experiment a year ago has turned into a full-fledged annual project for DATAMATION's editors. It has tripled in size since last year and threatens to devour even more resources in the years ahead. What could we be talking about? Open systems? Communcations standards? IS budgets?

No, it's something far less exotic than technology—yet perhaps just as important. The project is our international user group directory, which has swelled to 112 members in a mere 12 months. Groups report from every neck of the world's woods, with names as wild as MUG and THUGS. (No kidding, folks. The former stands for Ricoh's Mytool Users Group; the other represents the Tymnet Users Group.)

Communications in several different respects account for the explosive growth in this year's directory. The increasing need for users to communicate their problems and product development ideas to their strategic IS suppliers has made associations all the more important, all the more visible. Our own ability to communicate with these important groups also contributed to the directory's growth. And a communications device played a significant role in gathering names of groups from around the globe: the facsimile machine. Nearly half of this year's responses were submitted in fax form.

The technology enabled Executive Editor David Brousell, who first came up with the idea of producing a user group directory, to add signficant groups up to the last deadline minute without having to sacrifice accuracy—the usual victim in such circumstances. Brousell had help from a seasoned hand in information technology reporting, Kurt Rothschild, a consultant who made a name for himself in computer journalism long before faxes became pervasive.

Photograph by Steven Borns

FAX FANS David Brousell (l.) and Kurt Rothschild in DATAMATION's New York offices.

When Rothschild—who works a phone the way a programmer develops code, relentlessly and seemingly effortlessly—completed his dawn raids on recalcitrant European systems companies and user groups and his nocturnal calls to their counterparts across the Pacific, the fax machine began to whir with incoming messages from Weiterstadt to Turramurra (West Germany and Australia, respectively).

After assembling the directory, Rothschild interviewed the user groups, searching for their true identities and determining just how independent they were from the companies around whose products they had formed. You'll find his conclusions in "The Age of Influence" on p. 18. It's required reading, given the role your own user group ought to be playing in keeping your major IS suppliers on track.

Worthy of Optical Inspection

One topic on the technology horizon certain to grow even faster than our meteoric user group directory is erasable optical storage, the subject of Dallas Bureau Manager Bob Francis's story, "PC Backup Moves to Optical Era," p. 57. Francis goes beyond the headlines generated by Steve Jobs' use of optical drives in his NeXT system to discover that such products are no longer just promises. He reports on four manufacturers that now offer erasable optical drives.

Tim Mead

—*Tim Mead, Editor-in-Chief*

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pected to increase, most of these moves have resulted in few problems for the users of the affected companies or products. However, there can be an occasional problem, such as when a vendor changes policy.

A case in point is the decision by Martin Marietta Data Systems, Bethesda, Md., to discontinue its commercial software business. "This leaves us to fend completely for ourselves," says Larry Cram, president of the MAS (Modular Application Software) user group. One of the results of Martin Marietta's action is that a "goodly" number of users are dropping the package and going to some other software, he indicates. These users will, of course, then cease being members of the group, thereby weakening it. "The group may exist for another year or two, but then it will probably disappear," Cram predicts. This will make it even harder on those users who will continue to work with the software system, for the mutual support will deteriorate just at a time when it is most needed.

> In those days, nobody talked about any other vendor. Today, we have speakers from many other vendors, some recommended by Cray itself.
>
> STEVEN NIVER
> CRAY USER GROUP

"We have been looking at the possibility of getting a third-party software maintenance company to give the necessary support, but this is a very difficult program; it has more than 1 million lines of COBOL code," says Cram. "The user group has been trying to band together to keep a fault list, but without having access to the people who wrote the code—and most of them are already gone—it is extremely difficult to keep the system going."

Despite efforts to get Martin Marietta to change its mind, the company is adamant, according to Cram. "We were told that top management decided to cut it off because it was not profitable," he says. "We chose the program originally because of the company's position, but this shows that you can't count on anything."

Dan Canzano, general manager and director of manufacturing systems at Martin Marietta, says he can understand that some users may not be happy with his company's decision, but indicates that the company will continue to support its customers under existing contracts. "We think we made the right ethical decision," he says. He concedes, however, that in a situation such as this, when a company changes directions, "you can't satisfy everybody."

One thing that users everywhere will be able to count on, however, is the continued proliferation and growth in stature of user groups. As they grow in effectiveness, the IS industry itself will be more in tune with what the people who use its goods and services really want and need. And isn't that the true realization of democracy?

PC User Groups Are Too Numerous To Count

The rapid proliferation of microcomputers has spawned a new class of users who range from computer enthusiasts to desktop publishers, many of whom have formed their own user groups.

With the penetration of microcomputers into new applications, with the work often performed by untrained users, mass confusion is often the first result. As millions of these earnest but frustrated users try to make sense of their machines and the software that runs on them, reams of documentation can often serve as barriers instead of solutions. For experienced microcomputer users, the challenge can be even greater as they try to learn the latest about new software, hardware, and other developments.

To overcome this hurdle, many microcomputer users increasingly turn to user groups that have been formed for the chief purpose of dispensing helpful information. The groups serve microcomputer users in the same way that medium and large system user groups have served their members.

Like the micro itself, micro user groups have proliferated in the last five years: there are now more than 1,000 such groups, according to Cambridge Communications, an Arlington, Mass.-based research firm that tries to keep track of them. The 10 leading ones are listed here.

Groups vary considerably and offer different levels of knowledge and support. Some feature small meetings or special-interest groups, while others have mass meetings whose participants can include novices and executives.

A.P.P.L.E. Co-op
290 SW 43rd St.
Renton, WA 98055
(206) 251-5222
Contact: Charles Stillman,
member services manager
Members: 28,000 internationally

Berkeley Macintosh Users Group
1442A Walnut St., #62
Berkeley, CA 94709
(415) 549-2684
Contact: Herry Critchfield,
executive director
Members: 5,000-plus

Boston Computer Society
One Center Plaza
Boston, MA 02108
(617) 367-8080
Contact: Cathy Perry,
member relations manager
Members: 28,000

Capital PC User Group
51 Monroe St.
Plaza East Two
Rockville, MD 20850
(301) 762-6775
Contact: Tom Enrico,
president
Members: 6,000

Chicago Association for
Microcomputer Professionals
P.O. Box 380
Deerfield, IL 60015
(312) 831-0286
Contact: Julian Horwich,
executive director
Members: 560 microcomputer
managers and MIS developers
from 196 enterprises

Chicago Computer Society
P.O. Box 8681
Chicago, IL 60680
(312) 794-0706
Contact: Mary Dolce,
president
Members: 2,000

FOG International Computer
Users Group
P.O. Box 3474
Daly City, CA 94015
(415) 755-2000
Contact: Gale Rhoades,
executive director
Members: 17,000

Houston Area League
of PC Users
(HAL-PC)
P.O. Box 61266
Houston, TX 77208
(713) 64-HALPC
Contact: Jim Nech,
president
Members: 8,000-plus

Microcomputer Managers
Association
385 Sylvan Ave.
Englewood Cliffs, NJ 07632
(201) 569-8542
Contact: Virginia Talamo,
public relations spokesperson
Members: 500 managers

New York Personal
Computer Inc.
40 Wall St., Suite 2124
New York, NY 10005
(212) 533-NYPC
Contact: Ron Asher
Members: 2,800

The DATAMATION International
User Group Directory

The 1988/89 User Group Directory, organized by vendor company and listed alphabetically, contains 112 entries, nearly three times the number of user groups listed in the inaugural directory last year.

Vendor: AICorp.
Group Name: AICorp User Group
Address: 100 Fifth Ave.
Waltham, MA 02254
Phone: (617) 890-8400
Annual fee: None
Individual members: 1,600
Corporate members: 600
Systems/products: AI products and services that run on IBM mainframe series 370, 43XX, 30XX or compatibles, under the MVS/XA, VM, and MVS operating systems
Next meeting: October 1989, place to be announced
Top officer: NA
Relation to Vendor: Wholly owned
Purpose: To exchange experiences and information with AICorp executives and other users from around the world
Services provided: Periodic regional meetings and newsletters

Vendor: Altai Software Inc.
Group Name: Altai Software User Group
Address: 624 Six Flags Dr.
Arlington, TX 76011
Phone: (817) 640-8911
Annual fee: None
Individual members: 400
Corporate members: NA
Systems/products: Zeke, "The Scheduler That Works," and Zack, "The Operator's Operator"
Next meeting: May 3-5, 1989, San Diego
Top officer: Gladys Lee, University of California at San Diego
Relation to Vendor: Fully subsidized
Purpose: To exchange information and bring new product and product enhancement ideas to the vendor's attention
Services provided: Education and training in new products

As groups become larger and gain greater status, their actions become more independent of the vendors.

Vendor: Amdahl Corp.
Group Name: Amdahl Users Group
Acronym: AUG
Address: 1250 E. Arques Ave.
Sunnyvale, CA 94088
Phone: (408) 746-8959
Annual fee: None
Individual members: 400
Corporate members: 300
Systems/products: All Amdahl products
Next meeting: April 23-26, 1989, Boston
Top officer: George Frickle, USWest
Relation to Vendor: Partially subsidized
Purpose: To exchange information
Services provided: One national meeting per year

Vendor: Apple Computer Inc.
Group Name: The Apple User Group Connection (an umbrella organization comprised of approximately 1,100 separate user groups throughout the U.S.)
Address: 20525 Mariani Ave.
M/S 36AA
Cupertino, CA 95014
Phone: (800) 538-9696 (x500)
Annual fee: None. Fees for individual member groups vary.
Individual members: 500,000 in all user groups
Corporate members: 125
Systems/products: Macintosh and Apple II
Next meeting: NA
Top officer: Ellen Leanse, Apple
Relation to Vendor: Part of Apple marketing program
Purpose: To enable dissemination of information to user groups
Services provided: Monthly newsletter

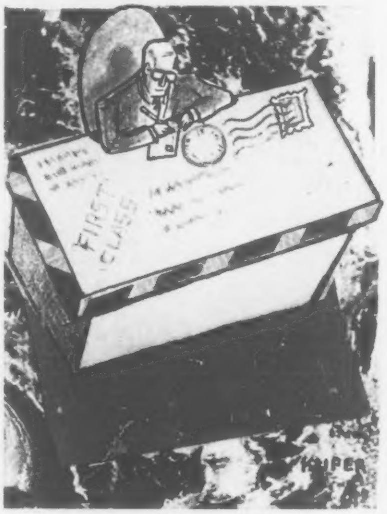
Vendor: Arthur Andersen & Co.
Group Name: ASSIST (A Shared Solution in Software Technology)
Address: 111 E. Wacker Dr.
Chicago, IL 60601
Phone: (312) 644-6610
Annual fee: None
Individual members: NA
Corporate members: 950
Systems/products: Arthur Andersen & Co.'s software
Next meeting: May 17-19, 1989, Chicago
Top officer: Chip Lombardo, The Trane Co.
Relation to Vendor: Partially subsidized
Purpose: To influence the direction and focus of product development activities
Services provided: Two conferences annually

Illustrations by Peter Kuper

Vendor: Ashton-Tate
Group Name: No single national group. However, there are more than 700 user groups and special interest groups in the PC environment with which Ashton-Tate interacts. There are also over 1,000 user groups in the Macintosh environment with which the vendor communicates, as well as separate corporate, government, and educational user groups.
Address: 20101 Hamilton Ave.
Torrance, CA 90502-1319
Phone: (213) 538-7455
Annual fee: Varies by group, generally ranging from $20 to $40
Individual members: NA
Corporate members: NA
Systems/products: All Ashton-Tate software packages
Next meeting: NA
Top officer: Marcie Glickman, Ashton-Tate
Relation to Vendor: Independent
Purpose: To exchange information and share ideas; to feed information back to vendor for product enhancements and new product development
Services provided: Quarterly newsletter sent to PC and Macintosh user groups

Vendor: AT&T
Group Name: Network Users Group—AT&T
Acronym: NUGATT
Address: University of Wisconsin
Stevens Point, WI 54481
Phone: (715) 346-2957
Annual fee: $50
Individual members: NA
Corporate members: NA; group newly formed in spring 1988
Systems/products: AT&T local network data communications
Next meeting: October 24-25, 1989, Washington, D.C.
Top officer: Stephen Patrick
Relation to Vendor: Independent
Purpose: To provide recommendations to AT&T for development of network products and management systems with the objective of encouraging unified architecture and integration of products
Services provided: One national meeting a year

Vendor: AT&T
Group Name: University Unix System V Users Group
Acronym: u3g
Address: AT&T
1776 On The Green
Morristown, NJ 07960
Phone: (800) 247-1212 (x585)
Annual fee: None
Individual members: 400
Corporate members: 250 universities
Systems/products: Unix System V Operating System
Next meeting: March 19-21, 1989, New Orleans
Top officer: David Binko, Johns Hopkins University



The professional management service sends mailings and newsletters and arranges for group meetings.

Relation to Vendor: Fully subsidized
Purpose: To share Unix System V public domain software; to provide technical resource to members, to support discussion on common topics of research and instruction
Services provided: One annual meeting; quarterly newsletter

Vendor: AT&T Unix Europe Ltd.
Group Name: European Unix Systems User Group
Acronym: EUUG
Address: Owles Hall
Buntingford, Herts, SG 9PL
England
Phone: (44) 763-73039
Annual fee: NA
Individual members: 3,500, including companies and academic institutions
Corporate members: NA
Systems/products: All Unix products
Next meeting: April 3-7, 1989, Brussels, Belgium
Top officer: Teus Hagen, OCE Netherlands
Relation to Vendor: Independent
Purpose: To promote the use of Unix and related services through the exchange of information and the cooperative efforts of its members
Services provided: Two national meetings per year; periodic workshops and tutorials; quarterly newsletters
Note: Fourteen other European countries have EUUG national groups.

B

Vendor: Banyan Systems Inc.
Group Name: Association of Banyan Users International
Acronym: ABUi
Address: 75 Union Ave.
Sudbury, MA 01776
Phone: (508) 443-3330
Annual fee: $395
Individual members: 325
Corporate members: NA
Systems/products: VINES
Next meeting: April 30-May 3, 1989, Danvers, Mass.
Top officer: John Good, Turner Construction Corp.
Relation to Vendor: Independent
Purpose: To exchange experiences and promote product development
Services provided: Two annual meetings; quarterly newsletter

Vendor: BMC Software Inc.
Group Name: BMC User Group
Acronym: BUG
Address: P.O. Box 2002
Sugar Land, TX 77487
Phone: (713) 240-8800
Annual fee: NA
Individual members: 136
Corporate members: NA
Systems/products: IBM mainframes
Next meeting: NA
Top officer: Chuck Gerton, Pacific Bell
Relation to Vendor: NA
Purpose: To exchange ideas; to influence future products
Services provided: Three regional meetings scheduled for 1989

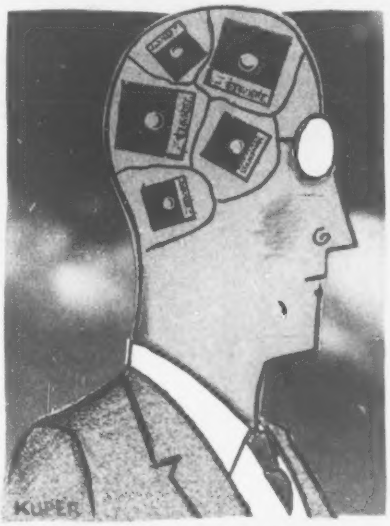
Vendor: Boole & Babbage Inc.
Group Name: IMF User Group
Address: 510 Oakmead Pkwy.
Sunnyvale, CA 94086

Phone: (408) 735-9550
Annual fee: None
Individual members: NA
Corporate members: NA
Systems/products: IMS AutoOperator, IMS Resource Analyzer, IMS Resource Monitor, IMS Workload Analyzer, IMS Workload Monitor, IMS Performance Reporter, IMS Transaction Accountant
Next meeting: October 1989, place to be announced
Top officer: Bert Cooley, New York State Electric & Gas Corp.
Relation to Vendor: Fully subsidized
Purpose: To exchange information on products and to request product enhancements
Services provided: Annual meeting

Vendor: Bull SA and Honeywell Bull
Group Name: European Federation of Bull & Honeywell Users Associations (with 15 member associations)
Acronym: EFOBHUA
Address: 43, rue de la Chaussée d'Antin
75009 Paris
France
Phone: (33) 1-48-74-94-17
Annual fee: £10
Individual members: None
Corporate members: 500
Systems/products: DPS 7, DPS 7000, and associated products
Next meeting: May 1989, Genoa, Italy
Top officer: Roland de Conihout, Methodes et Informatique
Relation to Vendor: Independent
Purpose: To establish contact with the developers and manufacturers of vendor's equipment; to coordinate the activity of technical groups set up to handle specific problems; to work in close cooperation at the international level toward a joint definition of systems application and new hardware specifications
Services provided: One international meeting per year; bimonthly newsletter

C

Vendor: CADAM Inc. (subsidiary of Lockheed Corp.)
Group Name: CUE North America
Acronym: CUE
Address: 312 Captain's Walk
Box 13
New London, CT 06320
Phone: (203) 443-2983
Annual fee: $400
Individual members: None
Corporate members: 427
Systems/products: All CADAM software
Next meeting: March 13-16, 1989, Los Angeles
Top officer: Rosemary Russo, McDonald's Corp.
Relation to Vendor: Independent
Purpose: To further communication between users and vendor; to promote the use of products and related vendor systems
Services provided: Two national meetings per year



Many of the older, hardware-originated groups have adopted a distinct and new software consciousness.

Vendor: Cincom Systems Inc.
Group Name: Network Management Users Group
Address: 10467 White Granite Dr.
Suite 300
Oakton, VA 22124
Phone: (703) 352-4482
Annual fee: None
Individual members: 40
Corporate members: NA
Systems/products: Net/Master software package
Next meeting: Spring 1989, place to be announced
Top officer: Nina Sumrall
Relation to Vendor: Independent
Purpose: To exchange information
Services provided: Two meetings per year; quarterly newsletter

Vendor: Cincom Systems Inc.
Group Name: Project Oriented (Manufacturers) Special Interest Group
Acronym: PROSIG
Address: 5353 Highland Dr.
Jackson, MS 39206
Phone: (601) 987-5229
Annual fee: $100
Individual members: NA
Corporate members: 20
Systems/products: Control: Manufacturing and Control: Financial
Next meeting: Spring 1989, place to be announced
Top officer: Judy Johnson, Vickers AMD
Relation to Vendor: Independent
Purpose: To increase awareness and use of software packages
Services provided: Three meetings per year

Vendor: Cognos Inc.
Group Name: No single national group. Groups organized on local or regional basis in Canada and the U.S.
Address: 3755 Riverside Dr.
P.O. Box 9707
Ottawa, Ont. K1G3Z4
Canada
Phone: (613) 738-1440
Annual fee: Varies by group
Individual members: NA
Corporate members: NA
Systems/products: PowerHouse software
Next meeting: Varies by group
Top officer: NA
Relation to Vendor: NA
Purpose: To exchange information on product and its use
Services provided: Meetings

Vendor: Comdisco Disaster Recovery Services Inc.
Group Name: CDRS
Address: 6111 N. River Rd.
Rosemont, IL 60018
Phone: (312) 698-3000
Annual fee: None
Individual members: None
Corporate members: 971
Systems/products: All
Next meeting: April 20-22, 1989, Orlando, Fla.
Top officer: Raymond Hipp
Relation to Vendor: Fully subsidized

Purpose: To provide a forum for disaster recovery information exchange and education
Services provided: One national meeting per year; quarterly newsletters

Vendor: Commodore Business Machines
Group Name: No single national group. Commodore does coordinate information on the approximately 600 independent user groups throughout the country based on geographic areas.
Address: 1200 Wilson Dr.
West Chester, PA 19380
Phone: (215) 431-9100
(215) 436-4200
Annual fee: Varies by group
Individual members: NA
Corporate members: NA
Systems/products: All products
Next meeting: NA
Top officer: Pete Baczor, Commodore
Relation to Vendor: Independent
Purpose: To exchange information
Services provided: Regional meetings

Vendor: Compaq Computer Corp.
Group Name: Compaq is not aware of a national user group devoted solely to its personal computers. However, company representatives frequently speak at meetings of large user groups whose members use its products.

Vendor: Computer Associates International Inc.
Group Name: Security and Audit Executive Committee
Address: 711 Stewart Ave.
Garden City, NY 11530
Phone: (516) 227-3300
Annual fee: None
Individual members: NA
Corporate members: NA
Systems/products: Security and Audit
Next meeting: July 9-13, 1989, place to be announced
Top officers: Abe Barkin, Blue Cross/Blue Shield of Illinois; George Latimer, EDS
Relation to Vendor: Independent
Purpose: To further the education of Computer Associates Security and Audit users; to further the awareness of security issues in general
Services provided: One national meeting is held per year; periodic newsletters on various security issues; local user groups; user database; enhancement tape

Vendor: Computer Associates International Inc.
Group Name: Systems Software Conference Executive Committee
Acronym: SSC
Address: 711 Stewart Ave.
Garden City, NY 11530
Phone: (516) 227-3300
Annual fee: None
Individual members: NA
Corporate members: NA
Systems/products: All products
Next meeting: Aug. 20-25, 1989, place to be announced
Top officer: To be named
Relation to Vendor: Independent
Purpose: To exchange information and increase awareness of systems software
Services provided: One meeting per year

Vendor: Comshare Inc.
Group Name: Comshare Users Group
Address: 3001 S. State St.
Ann Arbor, MI 48108
Phone: (313) 994-4800
Annual fee: None
Individual members: NA
Corporate members: NA
Systems/products: Comshare products
Next meeting: October 1989, place to be announced
Top officer: Patrick Dennis, Hayes Microcomputer Products Corp.
Relation to Vendor: Independent
Purpose: To facilitate the exchange of information about Comshare products
Services provided: Two meetings per year

Vendor: Concurrent Computer Corp.
Group Name: Interchange Inc.
Address: 106 Apple St.
Tinton Falls, NJ 07724
Phone: (201) 758-7575
Annual fee: $125
Individual members: 1,500
Corporate members: None
Systems/products: All Concurrent, Perkin-Elmer, and Interdata products
Next meeting: October 1989, Orlando, Fla.
Top officer: Pete Massiello, Perkin-Elmer Corp.
Relation to Vendor: Independent
Purpose: To establish and maintain a vehicle to facilitate information exchange among the membership
Services provided: One national meeting per year; quarterly newsletter; two software catalogue libraries; electronic bulletin board

Vendor: Control Data Corp.
Group Name: VIM Inc.
Address: 8100 34th Ave. S.
Minneapolis, MN 55440
Phone: (612) 853-6311
Annual fee: $100
Individual members: NA
Corporate members: 315
Systems/products: All CDC products
Next meeting: May 14-18, 1989, Orlando, Fla.
Top officer: Abe Levine, Rockwell International
Relation to Vendor: Partially subsidized
Purpose: To provide CDC with the opportunity to present its plans and ideas to VIM members; to provide a unified approach to CDC on modifications and enhancements on hardware and associated CDC-supplied software
Services provided: Two national meetings and two interim meetings per year; bimonthly newsletter

Vendor: Control Data Corp.
Group Name: European Control Data Users
Acronym: ECODU
Address: 8100 34th Ave. S.
Minneapolis, MN 55440
Phone: (612) 853-6311
Annual fee: SFr300
Individual members: NA
Corporate members: 160
Systems/products: All CDC products
Next meeting: April 17-21, 1989, Wolfsburg, West Germany
Top officer: Dietz Schubring, LRZ
Relation to Vendor: Partially subsidized
Purpose: To communicate with CDC by presenting the opinions, recommendations, and requests of ECODU members regarding CDC hardware, software, and related CDC services
Services provided: Two national meetings per year; bimonthly newsletter

Vendor: Control Data Corp.
Group Name: VIM-Australasia
Address: 8100 34th Ave. S.

Minneapolis, MN 55440
Phone: (612) 853-6311
Annual fee: None
Individual members: NA
Corporate members: 20
Systems/products: All CDC products
Next meeting: May 1989, place to be announced
Top officer: Alan Bell, University of Melbourne
Relation to Vendor: Partially subsidized
Purpose: To present CDC with the opinions, recommendations, and requests of the group's members
Services provided: One annual meeting; bimonthly newsletter

Vendor: Convergent Technologies Inc.
Group Name: Convergent Technologies User Forum
Acronym: CTUF
Address: 2700 N. First St.
P.O. Box 6685
San Jose, CA 95150-6685
Phone: (408) 435-3690
Annual fee: $95
Individual members: NA
Corporate members: 75
Systems/products: All Convergent Technologies' systems
Next meeting: May 1989, Washington, D.C.
Top officer: Alan Himmelstein, Mini Computer Associates
Relation to Vendor: Independent
Purpose: To provide a forum for resellers, software developers, distributors, oems, and users with similar interests and concerns
Services provided: Two meetings per year; newsletter

Vendor: Cray Research Inc.
Group Name: Cray User Group Inc.
Acronym: CUG
Address: 608 Second Ave. S.
Minneapolis, MN 55402
Phone: (612) 334-6422
Annual fee: $200
Individual members: None
Corporate members: 120
Systems/products: All Cray products
Next meeting: April 25-29, 1989, Los Angeles
Top officer: Steve Niver, Boeing Computer Services
Relation to Vendor: Independent
Purpose: To promote the free interchange of information and ideas of value to users of Cray computers
Services provided: Two meetings per year; quarterly newsletter

Vendor: Cullinet Software Inc.
Group Name: Integrated Database Management System
Acronym: IDMS
Address: 111 E. Wacker Dr.
Chicago, IL 60601
Phone: (312) 644-6610
Annual fee: None
Individual members: NA
Corporate members: 1,800
Systems/products: All Cullinet software packages
Next meeting: Feb. 26-March 2, 1989, New York
Top officer: Joseph Spink, McNeil Pharmaceutical
Relation to Vendor: Independent
Purpose: To promote cooperation between users and to enhance product knowledge and development
Services provided: One annual meeting; quarterly newsletter

D

Vendor: Data General Corp.
Group Name: North American Data General Users Group
Acronym: NADGUG
Address: 3400 Computer Dr.
Westboro, MA 01580
Phone: (508) 898-4367
Annual fee: $40
Individual members: 3,032
Corporate members: None
Systems/products: All DG products
Next meeting: Sept. 18, 1989, place to be announced
Top officer: Donald Clark, Security Forces Inc.
Relation to Vendor: Partially subsidized
Purpose: To promote the interchange of ideas between Data General and its users
Services provided: One national conference per year; monthly magazine

Vendor: Datapoint Corp.
Group Name: National Datapoint Users Group
Acronym: NDUG
Address: P.O. Box 9197
Arlington, VA 22209
Phone: (703) 841-8515
Annual fee: To be decided at first meeting
Individual members: NA; newly formed group
Corporate members: NA; newly formed group
Systems/products: All Datapoint products and non-Datapoint products that connect to Datapoint's ARCnet
Next meeting: June 1989, San Antonio
Top officer: Robert Happ
Relation to Vendor: Independent
Purpose: To assist in the formation of local user groups and to provide information on where users can see products in live environment
Services provided: One annual meeting

Vendor: Diebold Inc.
Group Name: The Advisory Group
Acronym: TAG
Address: P.O. BOX 2804
N. Canton, OH 44720
Phone: (216) 497-5018
Annual fee: $230
Individual members: 275
Corporate members: None
Systems/products: Diebold ATMs
Next meeting: Sept. 17-20, 1989, New Orleans
Top officer: Robert Cullinan, Shawmut Bank NA
Relation to Vendor: Independent
Purpose: To provide users with an opportunity to communicate to Diebold issues related to products and services and to share information with other members; to provide input to the vendor on product enhancements and developments
Services provided: One national meeting per year; one regional meeting in each of 60 regions; quarterly newsletters

Vendor: Digital Equipment Corp.
Group Name: Digital Equipment Computer Users Society
Acronym: DECUS
Address: 219 Boston Post Rd., BPO2
Marlboro, MA 01752
Phone: (508) 480-3290
Annual fee: None
Individual members: U.S.: 65,000+, Worldwide: 115,000
Corporate members: None
Systems/products: All Digital products
Next meeting: May 7-12, 1989, Atlanta
Top officer: Bill Brindley, HDQ, Naval Security Group Command (President, DECUS U.S. Chapter)
Relation to Vendor: Partially

subsidized
Purpose: To promote the exchange of information processing-related ideas among users of Digital Equipment Corp. products
Services provided: Two national symposia per year; 20 special interest groups; 160 local users groups; monthly technical newsletter; quarterly magazine

E

Vendor: Epson America Inc.
Group Name: National Epson Users Group (with approximately 30 local user groups throughout the country)
Acronym: NEUG
Address: P.O. Box 1076
Lemont, PA 16851
Phone: (814) 237-5511
Annual fee: $25
Individual members: 2,400
Corporate members: None
Systems/products: QX-10, QX-16, PX-8, HX-20, and Equity line of computers; MX, FX, RX, and LQ line of printers
Next meeting: March 1989, State College, Pa.
Top officer: Richard Shoemaker
Relation to Vendor: Independent
Purpose: To exchange information about Epson line of equipment and its use
Services provided: One meeting a year; monthly newsletter

Vendor: Erisco Inc. (subsidiary of Dun & Bradstreet Corp.)
Group Name: UserFacts Inc.
Address: 1700 Broadway
New York, NY 10019
Phone: (212) 765-8500
Annual fee: $200
Individual members: None
Corporate members: 78
Systems/products: ClaimFacts, an on-line system for the administration of health care claims; and CertiFacts, an on-line utilization review system for preadmission certification, concurrent stay review, discharge planning, and retrospective utilization review
Next meeting: May 17-20, 1989, Fort Lauderdale, Fla.
Top officer: Renee Baderman, Ryder System Inc.
Relation to Vendor: Independent
Purpose: To promote the effectiveness of member companies
Services provided: One annual conference

F

Vendor: Finsiel SpA
Group Name: Banking Automation Research Program
Acronym: PRAB 2
Address: Data Management
V. le Eginardo 29
20149 Milan
Italy
Phone: (39) 2-49931
Annual fee: $1,600
Individual members: None
Corporate members: 15
Systems/products: Finsiel software related to banking automation
Next meeting: Spring 1989
Top officer: A. Petruzellis
Relation to Vendor: Independent
Purpose: To analyze banking problems and create interest in systems and solutions provided by data management
Services provided: One or two conferences per year

A good measure of a user group's continuing vitality is the growth in the size of its user membership.

Vendor: Finsiel SpA
Group Name: Personnel Management User Group
Acronym: GEPE
Address: Data Management
V. le Eginardo 29
20149 Milan
Italy
Phone: (39) 2-49931
Annual fee: $1,600
Individual members: None
Corporate members: 70
Systems/products: Finsiel personnel management software packages
Next meeting: NA
Top officer: A. Pellegrini
Relation to Vendor: Independent
Purpose: To facilitate the exchange of information on the GEPE package, and to educate users in its use
Services provided: Two conferences and two technical meetings per year; bimonthly newsletters regarding issues of interest to Finsiel users

Vendor: Fujitsu Ltd.
Group Name: FACOM Family Kai
Address: 6-1 Marunouchi 1-chome
Tokyo 100
Japan
Phone: (81) 3-216-3211
Annual fee: 24,000
Individual members: None
Corporate members: 3,950
Systems/products: All Fujitsu computers
Next meeting: May 1989, Tokyo
Top officer: Hideo Watanabe, Mitsubishi Kasei Corp.
Relation to Vendor: Partially subsidized
Purpose: To research and discuss the effective use and improvement of FACOM computers
Services provided: One national meeting per year; periodic newsletters and other publications regarding Fujitsu products and issues of interest to their users

Vendor: Fujitsu Ltd.
Group Name: Fujitsu Large Systems Users Group
Acronym: LS-ken
Address: 17-25 Shin-Kamata 1-chome
Ota-ku, Tokyo 144
Japan
Phone: (81) 3-735-1111
Annual fee: 30,000
Individual members: None
Corporate members: 246
Systems/products: Fujitsu systems larger than M-360 or M-760/8
Next meeting: June 16, Tokyo
Top officer: Padao Ito, Toray Systems Center Inc.
Relation to Vendor: Partially subsidized
Purpose: To provide the opportunity

for group members to exchange information and solve system-related problems; to research uses of advanced technology and future system trends; to propose to Fujitsu recommendations concerning Fujitsu hardware and software
Services provided: One national meeting per year; quarterly newsletter

Vendor: Fujitsu Ltd.
Group Name: Scientific Systems Users Association
Acronym: SS-ken
Address: 17-25 Shin-Kamata 1-Chome
Ota-ku, Tokyo 144
Japan
Phone: (81) 3-735-1111
Annual fee: 20,000
Individual members: 2
Corporate members: 57
Systems/products: Large-scale FACOM computers
Next meeting: April 1989, Tokyo
Top officer: Makoto Nagao, Kyoto University
Relation to Vendor: Partially subsidized
Purpose: To facilitate the exchange technical information needed by FACOM mainframe users in scientific and technical fields; and to conduct discussions to respond to users' information processing needs and to solve problems
Services provided: Meetings held on specific subjects; periodic newsletters

G

Vendor: Global Software Inc.
Group Name: Global Software User Group Inc.
Address: P.O. Box 51420
Raleigh, NC 27615
Phone: (800) 334-7192
Annual fee: None
Individual members: NA
Corporate members: 2,000
Systems/products: All software sold by Global
Next meeting: Oct. 15-18, 1989, Nashville
Top officer: Vicki Walkup, Mead Corp.
Relation to Vendor: Independent
Purpose: To facilitate product development and training efforts; and to provide a medium for product enhancement and suggestions from Global users
Services provided: Quarterly newletter

Vendor: Gould Inc.
Group Name: Gould CSD User Group
Address: 6901 W. Sunrise Blvd.
Plantation, FL 33310
Phone: (305) 797-5717
Annual fee: None
Individual members: 2,500
Corporate members: None
Systems/products: All Gould products
Next meeting: Spring 1989, Fort Lauderdale, Fla.
Top officer: Ron Kirkpatrick, GE Government Services
Relation to Vendor: Fully subsidized
Purpose: To facilitate and promote free exchange of information and ideas pertaining to the use of Gould computers and software; to inform Gould CSD users of new products and current developments in existing products
Services provided: Two national meetings are held per year; periodic newsletters on issues of concern to Gould users; software donations

Vendor: Groupe Bull
Group Name: HLSUA-Europe
Address: 5, Square Henri Delormel
75014 Paris
France
Phone: (33) 1-45-40-90-14
Annual fee: FF1,050
Individual members: 400
Corporate members: 250
Systems/products: GCOS 8 products
Next meeting: May 16-18, 1989, San Vicenzo, Italy
Top officer: J.J. Renault, RATP
Relation to Vendor: Independent
Purpose: To provide service and support to users
Services provided: Two annual meetings; bimonthly newsletter

H

Vendor: Hewlett-Packard Co.
Group Name: Interex Inc. (formerly known as International Association of HP Computer Users)
Address: 680 Almanor Ave.
Sunnyvale, CA 94086
Phone: (408) 738-4848
Annual fee: Individual: $80, Corporate: $400
Individual members: 9,000
Corporate members: 5,600
Systems/products: All HP computer products
Next meeting: March 8-10, 1989, Nashville
Top officer: Robert Grenoble
Relation to Vendor: Independent
Purpose: To promote common business interests, and to advocate the needs of the users of Hewlett-Packard computer products and related software, hardware, and peripheral devices
Services provided: Four national and one international meeting per year; two monthly magazines and one monthly newsletter on issues of concern to HP users

Vendor: Hitachi Ltd.
Group Name: HITAC Users Association
Address: Hitachi Omori Annex 12
27-18, Minami-Oi 6-chome
Shinagawa-ku, Tokyo 140
Japan
Phone: (81) 3-763-2411 (x3201, 3205)
Annual fee: 24,000
Individual members: NA
Corporate members: 1,700
Systems/products: All Hitachi computer systems
Next meeting: June 1989, Osaka
Top officer: Kenzo Sakai, Shoko Chukin Bank
Relation to Vendor: Independent
Purpose: To conduct studies and facilitate the exchange ideas for the effective use of Hitachi computer systems
Services provided: One national meeting annually; magazine and research papers

Vendor: Hogan Systems Inc.
Group Name: HUG (Hogan User Group) International Inc.
Acronym: HUG
Address: 5008 Pine Creek Dr.
Westerville, OH 43081
Phone: (614) 895-1362
Annual fee: $400
Individual members: None
Corporate members: 110
Systems/products: Hogan systems software and IBM financial application software
Next meeting: April 18-21, 1989, Nashville
Top officer: Sanford E. Leake Jr., Great Western Bank
Relation to Vendor: Independent
Purpose: To exchange ideas among members and to advise Hogan Systems and IBM on product enhancements

Services provided: One annual meeting; quarterly journal

Vendor: Honeywell Bull Inc.
Group Name: HLSUA-U.S.
Acronym: HLSUA
Address: 4000 Town Center, 8th Fl.
Southfield, MI 48075
Phone: (313) 351-4677
Annual fee: $325
Individual members: None
Corporate members: 450
Systems/products: All Honeywell Bull products (predominantly medium and large systems)
Next meeting: April 9-12, 1989, San Diego
Top officer: William C. McCusker, Citrus Community College, Glendora, Calif.
Relation to Vendor: Independent
Purpose: To provide a forum for users to exchange and disseminate information on products and techniques; to promote the use of products and related vendor systems
Services provided: Two national meetings per year; semiannual newsletter

Vendor: Honeywell Bull Inc.
Group Name: North American Honeywell Users Association
Acronym: NAHU
Address: P.O. Box 2037
Willingboro, NJ 08046
Phone: (609) 871-1531
Annual fee: $125
Individual members: None
Corporate members: 538
Systems/products: DPS 4, 6, 7/7000, Level 6, Level 62/64; DPS 8; and microproducts
Next meeting: March 5-9, 1989, Rye Brook, N.Y.
Top officer: Shirley Eick, Metropolitan Life Inc.
Relation to Vendor: Independent
Purpose: To promote the exchange of information between member units and vendors, and to stimulate the timely interchange of information and ideas among the member units
Services provided: Two national meetings per year; regional group meetings; educational seminars at reduced cost

Vendor: IBM Corp.
Group Name: Australasian SHARE/GUIDE Ltd.
Address: P.O. Box 62
Turramurra,
New South Wales 2074
Australia
Phone: (61) 2-449-6848
Annual fee: $A820 first year, $A620 thereafter
Individual members: NA
Corporate members: 240
Systems/products: IBM System/370 machine architecture and MVS, VM, VSE operating systems and associated information processing products and services
Next meeting: Feb. 26-March 1, 1989, Melbourne
Top officer: Peter Lloyd, State Government Insurance Commission
Relation to Vendor: Independent
Purpose: To promote mutual support and influence the development of information processing products and services
Services provided: Two regional meetings are held per year (within Australia and New Zealand); periodic research publications; support of associated user groups within the Western Pacific

Vendor: IBM Corp.
Group Name: COMMON—A Users Group
Address: 111 E. Wacker Dr.
Chicago, IL 60601
Phone: (312) 644-6610
Annual fee: $250
Individual members: Over 4,800 member installations and individuals
Corporate members: NA
Systems/products: System/34, 36, 38, and 88, 5520, AS/400, Series/1, 43XX, 9370, and other 370 Architecture Systems, and the IBM PC
Next meeting: April 23-27, 1989, New Orleans
Top officer: Robert A. Sutherland, Robert Sutherland Associates Inc.
Relation to Vendor: Independent
Purpose: To promote interchange of information about these systems and their use
Services provided: Semiannual conferences; quarterly newsletter and other publications

Vendor: IBM Corp.
Group Name: Guidance for Users of Integrated Data Equipment Inc.
Acronym: GUIDE
Address: 111 E. Wacker Dr.
Chicago, IL 60601
Phone: (312) 644-6610
Annual fee: $400
Individual members: None
Corporate members: 2,850
Systems/products: 4300 or 308X minimum
Next meeting: March 12-17, 1989, Anaheim, Calif.
Top officer: Gary S. Gesme, Deere & Co.
Relation to Vendor: Independent
Purpose: To provide user information on the proliferation of hardware and software in today's market and to develop projections for future developments and trends; to work closely with IBM to make data processing systems as reliable and dependable as users require
Services provided: Three national meetings per year; biannual executive symposia; newsletters and other project publications

Vendor: IBM Corp.
Group Name: SHARE Inc.
Address: 111 E. Wacker Dr.
Chicago,
IL 60601
Phone: (312) 822-0932
Annual fee: $250 initial fee
Individual members: None
Corporate members: 2,640
Systems/products: Complex IBM systems
Next meeting: Feb. 26-March 3, 1989, Los Angeles
Top officer: Cecilia Cowles, Cornell University
Relation to Vendor: NA
Purpose: To improve the effectiveness of members' information systems by promoting mutual support and by influencing IBM's products and services
Services provided: Four national meetings are held per year; publication of technical reports, computer management and evaluation compendium, and newsletter issues of interest to users

Vendor: IBM Corp.
Group Name: SHARE European Association
Acronym: SEAS
Address: 17, rue Pierres du Niton
1207 Geneva
Switzerland
Phone: (41) 22-35-40-66
Annual fee: NA
Individual members: 450

Corporate members: NA
Systems/products: Large-scale and midrange IBM machines
Next meeting: April 3-7, 1989, Vienna
Top officer: Sverre Jarp, CERN
Relation to Vendor: Independent
Purpose: To provide an opportunity for exchange of information among computer users and computer centers in Europe, the Middle East, and Africa
Services provided: Two meetings a year; newsletter

Vendor: ICL
Group Name: ICL Computer Users Association (an umbrella organization for 40 separate user groups)
Acronym: ICLCUA
Address: P.O. Box 42
Bracknell, Berkshire,
RG12 2LQ
England
Phone: (44) 3-44-482933
Annual fee: NA
Individual members: 4,000
Corporate members: same
Systems/products: All ICL products from Series 39 to DRS Distributed Systems
Next meeting: May 22-24, 1989, Birmingham, England
Top officer: Ken Wingfield, Doncaster MBC
Relation to Vendor: Independent
Purpose: To coordinate activities of member user groups; to achieve the most effective use of ICL products and to assist ICL to meet the present and future needs of users
Services provided: One major association conference per year; meetings four times per year of each member user group; periodic management and technical seminars, conferences, and exhibitions; collective representation to ICL and government standards organizations; quarterly magazine

Vendor: Index Technology Corp.
Group Name: XL/Group Inc. (including 20 local user groups)
Address: One Main St.
Cambridge, MA 02142
Phone: (617) 494-8200
Annual fee: $95
Individual members: NA
Corporate members: 483
Systems/products: Excelerator, Excelerator/RTS, XL/DI, PC Prism
Next meeting: September 26, 1989, Coronado, California
Top officer: Dennis Barham, CIGNA Corp.
Relation to Vendor: Independent
Purpose: To share ideas and technology among members and between members and vendor
Services provided: Quarterly newsletter; discounts on classes and on yearly conference

User groups may not directly decide a vendor's policies, but they are a force to be reckoned with.

Vendor: Intergraph Corp.
Group Name: International Intergraph Graphics Users Group (an umbrella organization for national user groups)
Acronym: IIGUG
Address: One Madison Industrial Pk.
Huntsville, AL 35807
Phone: (205) 772-2292
Annual fee: None
Individual members: None
Corporate members: None
Systems/products: All Intergraph and third-party equipment
Next meeting: May 7-11, 1989, Huntsville, Ala.
Top officer: Ray Bober, Ebasco
Relation to Vendor: Independent
Purpose: To influence direction of Intergraph development efforts
Services provided: One international and one U.S. group meeting per year; periodic newsletters

L

Vendor: Lotus Development Corp.
Group Name: No single major user group. Nationally, there are 30 independent user groups with a membership of 500 or more each. In addition, there are several hundred smaller regional user groups as well as user groups within specific corporations.
Address: User Group Program
55 Cambridge Pkwy.
Cambridge, MA 02142
Phone: (617) 577-8500
Annual fee: NA
Individual members: NA
Corporate members: NA
Systems/products: All Lotus software products
Next meeting: NA
Top officer: NA
Relation to Vendor: Independent
Purpose: To exchange information among users and vendor
Services provided: Publish quarterly newsletter for those user groups registered with Lotus

M

Vendor: MAI Basic Four Inc.
Group Name: Key Accounts Program
Acronym: KAP
Address: 14101 Myford Rd.
Tustin, CA 92680
Phone: (714) 730-2698
Annual fee: None
Individual members: 800
Corporate members: 420
Systems/products: All MAI Basic Four products
Next meeting: May 1989, Palm Springs, Calif.
Top officer: Bernard Jubb, MAI Basic Four Inc.
Relation to Vendor: Fully subsidized
Purpose: To serve the special needs of MAI Basic Four's largest customers through a single point of contact at the company
Services provided: One national meeting per year; quarterly newsletters

Vendor: Management Science America Inc.
Group Name: Interact (an umbrella organization for 10 regional and industry-specific groups in the U.S. as well as additional groups in other countries)
Address: 3445 Peachtree Rd. N.E.
Atlanta, GA 30326
Phone: (404) 239-2506
Annual fee: None

Individual members: All clients are members
Corporate members: NA
Systems/products: All MSA software
Next meeting: May 14-18, 1989, Atlanta
Top officer: Dick Baker, Associated Insurance Companies Inc.
Relation to Vendor: Fully subsidized
Purpose: To exchange information and to promote product improvement
Services provided: Several international meetings, one national meeting, and 10 regional or industry-specific meetings a year in the U.S.; quarterly publications

Vendor: Martin Marietta Data Systems
Group Name: MAS User Group
Address: 515 Shaw Rd.
Sterling, VA 22170
Phone: (703) 689-4400
Annual fee: $50
Individual members: None
Corporate members: 22
Systems/products: All MAS Software
Next meeting: April 11, 1989, Sterling, Va.
Top officer: Larry Cram, Star Technologies Inc.
Relation to Vendor: Independent
Purpose: To exchange ideas among users of MAS software
Services provided: Two national meetings per year; periodic newsletters

Vendor: McCormack & Dodge Corp.
Group Name: McCormack & Dodge User Group USA (an umbrella organization with member groups organized by product, industry, or region)
Address: 1225 Worcester Rd.
Natick, MA 01760
Phone: (508) 650-2311
Annual fee: None
Individual members: All customers
Corporate members: All customers
Systems/products: Financial, human resource, tools, and manufacturing software packages
Next meeting: June 18-21, 1989, Nashville
Top officer: NA
Relation to Vendor: Independent
Purpose: To foster communication with users and vendor
Services provided: Meetings

Vendor: McCormack & Dodge Systems Canada
Group Name: Association of Canadian Users
Acronym: ASCUS
Address: 7100 Woodbine Ave.
Markham, Ont. L3R 5J2
Phone: (416) 477-9680
Annual fee: None
Individual members: All customers
Corporate members: All customers
Systems/products: Financial, human resource, manufacturing, and tools software
Next meeting: June 18-21, 1989, Nashville
Top officer: NA
Relation to Vendor: Independent
Purpose: To foster communication with users and vendor
Services provided: Meetings

Vendor: McCormack & Dodge U.K. Ltd.
Group Name: McCormack & Dodge User Group U.K.
Address: P.O. Box 273
Kings House, Bond St.
Bristol BS99 7AL
England
Phone: (44) 272-276-866
Annual fee: None
Individual members: All U.K. users
Corporate members: All U.K. users
Systems/products: Financial, manufacturing, and tools software
Next meeting: September 1989, place to be announced
Top officer: NA
Relation to Vendor: Independent
Purpose: To foster communication with users and vendor
Services provided: Meetings

Vendor: McDonnell Douglas Network Systems Co.
Group Name: Tymnet Users Group
Acronym: THUGS
Address: 2560 N. First St.
San Jose, CA 95161
Phone: (408) 922-6667
Annual fee: None
Individual members: Public and private network customer base
Corporate members: NA
Systems/products: All of McDonnell Douglas communication product lines
Next meeting: June 1989, place to be announced
Top officers: Robert Nowell, TRW Inc. (representing private network sector); Doug Shelton, Puritan Bennett (representing public network sector)
Relation to Vendor: Independent
Purpose: To maintain a close working relationship with McDonnell Douglas
Services provided: One national meeting annually; quarterly newsletter; one magazine

Vendor: McDonnell Douglas Network Systems Co.
Group Name: Internally Switched Interface System (ISIS) for International Tymnet Users
Acronym: ISIS
Address: 2560 N. First St.
San Jose, CA 95161
Phone: (408) 922-7534
Annual fee: None
Individual members: NA
Corporate members: 40-50 members (only users with equipment installed in Europe can become members)
Systems/products: Private network systems
Next meeting: May 1989, location to be announced
Top officer: Bob Barbour, McDonnell Douglas
Relation to Vendor: Independent
Purpose: To exchange information about Tymnet technology and to influence future Tymnet product development efforts
Services provided: Two meetings per year

Vendor: McDonnell Douglas Computer Systems Co.
Group Name: MICRU International
Address: 1732 Montane Drive E.
Golden, CO 80401
Phone: (303) 526-9862
Annual fee: $50
Individual members: 650
Corporate members: 150
Systems/products: McDonnell Douglas Series 6000, 9200, 18; Series 7000
Next meeting: June 10-13, 1989, Dallas
Top officer: Herb Jackson
Relation to Vendor: Independent
Purpose: To provide an independent forum for information exchange for members of the McDonnell Douglas community
Services provided: One national educational conference per year; periodic newsletters

Vendor: McDonnell Douglas Health Systems Co.

Group Name: IHS (Integrated Hospital System) Users Group
Acronym: IHSUG
Address: 600 McDonnell Blvd.
Hazelwood, MO 63042
Phone: (314) 234-1549
Annual fee: $100
Individual members: None
Corporate members: 36
Systems/products: Integrated financial and clinical systems
Next meeting: Feb. 19-22, 1989, Sacramento, Calif.
Top officer: Dar Watkins, Tarpon Springs General Hospital, Tarpon Springs, Fla.
Relation to Vendor: Independent
Purpose: To provide a forum for information exchange; to influence McDonnell Douglas in its product development and enhancement efforts
Services provided: Two national meetings per year; bimonthly newsletter

Vendor: Metier Management Systems Inc. (subsidiary of Lockheed)
Group Name: Artemis Users Association
Acronym: AUA
Address: 2900 N. Loop W.
Houston, TX 77092
Phone: (713) 956-7511
Annual fee: None
Individual members: 1,200
Corporate members: 300
Systems/products: All Artemis products
Next meeting: November 1989, place to be announced
Top officer: Ian Koenig, System One
Relation to Vendor: Independent
Purpose: To share the benefits of users' experience with Artemis, and to interface collectively to Metier
Services provided: One national meeting per year; quarterly newsletters

Vendor: Microsoft Corp.
Group Name: No single user group, but company is aware of several hundred local, regional, and special interest groups.
Address: 16011 N.E. 36th Way
Box 97017
Redmond, WA 98073
Phone: (206) 882-8080
Annual fee: NA
Individual members: NA
Corporate members: NA
Systems/products: All Microsoft Corp. software packages
Next meeting: NA
Top officer: Mimi Getchell, Microsoft
Relation to Vendor: Independent
Purpose: To exchange information and to learn more about applications of Microsoft Corp. software
Services provided: NA

Vendor: Motorola Computer Systems Inc.
Group Name: Motorola Computer Systems Users Group
Address: 1309 E. Algonquin Rd.
Schaumburg, IL 60196
Phone: (312) 576-8866
Annual fee: None
Individual members: 150-200
Corporate members: 20
Systems/products: All products
Next meeting: May or June 1989, Schaumburg, Ill.
Top officer: Dan Kinder, Purdue University
Relation to Vendor: Partially subsidized
Purpose: To exchange information
Services provided: One annual meeting

N

Vendor: Nantucket Corp.
Group Name: No national user group, but over 50 local and regional users groups throughout the world
Address: 12555 W. Jefferson Blvd.
Los Angeles, CA 90066
Phone: (213) 390-7923
Annual fee: Various groups set their own fees
Individual members: NA
Corporate members: NA
Systems/products: Clipper database development system for MS-DOS and PC-DOS for the IBM PC family and compatibles
Next meeting: NA
Top officer: NA
Relation to Vendor: Independent
Purpose: To exchange information and learn about products
Services provided: Groups publish their own newsletters

Vendor: NCR Corp.
Group Name: Federation of NCR User Groups (with 32 member user groups)
Acronym: FNUG
Address: Mail Station USG-2
Dayton, OH 45479
Phone: (513) 445-3131
Annual fee: $100 for each of FNUG's 32 subsidiary groups. Subsidiary user groups charge their company members annual fees that vary by group.
Individual members: NA
Corporate members: 4,000
Systems/products: All NCR products
Next meeting: April 23-26, 1989, Orlando, Fla.
Top officer: James G. Davies, Cobb EMC
Relation to Vendor: Independent
Purpose: To offer users a unified voice in communicating with NCR; to provide educational forums; and to combine the resources of all 32 member groups
Services provided: One user conference and one technical seminar annually; quarterly newsletter

Vendor: NCR Corp.
Group Name: North American NCR Financial Users Group
Acronym: NANCRFUG
Address: 5008 Pine Creek Dr.
Westerville, OH 43081
Phone: (614) 895-1280
Annual fee: $150
Individual members: None
Corporate members: 275
Systems/products: NCR equipment and NCR financial software
Next meeting: Sept. 24-27, 1989, Lexington, Ky.
Top officer: Charles Ashley, Sovran Bank/Kentucky
Relation to Vendor: Independent
Purpose: To facilitate the exchange ideas and experiences among financial users of NCR computers, and to provide two-way communication between these users and the manufacturer
Services provided: Two annual meetings; quarterly journal

Vendor: The Newtrend Group Inc.
Group Name: MISER Users Group Inc.
Acronym: MUG
Address: 5008 Pine Creek Dr.
Westerville, OH 43081
Phone: (614) 899-6301
Annual fee: $400
Individual members: None
Corporate members: 146
Systems/products: MISER financial software package
Next meeting: May 17-19, 1989, San Diego
Top officer: David Randall, Vancouver Federal
Relation to Vendor: Independent

Purpose: To exchange information and to make maximum use of software
Services provided: One annual meeting; quarterly newsletter

Vendor: Nixdorf Computer AG
Group Name: EDV-Anwenderkreis e.V.
Acronym: EAK
Address: P.O. Box 31
6992 Weikersheim
West Germany
Phone: (49) 7934-8911
Annual fee: DM180
Individual members: 327
Corporate members: 323 (in West Germany, Switzerland, and Denmark)
Systems/products: Nixdorf systems 8810, 8840, 8860, and 8870 Quatro, 8890; standard software Nixdorf COMET TOP; Nixdorf vertical market software
Next meeting: NA
Top officer: Ruediger Brand
Relation to Vendor: NA
Purpose: To provide information and to facilitate purchasing
Services provided: Consulting

Vendor: Norsk Data AS
Group Name: Norsk Computer Users Society
Acronym: NOCUS
Address: P.O. Box 44 Bogerud
0621 Oslo 6
Norway
Phone: (47) 262-8000
Annual fee: NKr1000
Individual members: None
Corporate members: 650
Systems/products: All Norsk Data and Norsk Data-related products
Next meeting: Feb. 7-8, 1989, Bergen, Norway
Top officer: Janett South, Statoil, Stavanger
Relation to Vendor: Partially subsidized
Purpose: To provide information to users for making the best possible use of their equipment
Services provided: Four conferences a year; quarterly newsletter

O

Vendor: On-Line Software International Inc.
Group Name: Federation of RAMIS Users and Managers International Inc.
Acronym: FORUM International Inc.
Address: 800 N. Lindbergh Blvd.
St. Louis, MO 63167
Phone: (314) 694-7769
Annual fee: None
Individual members: 100,000
Corporate members: 1,000
Systems/products: RAMIS Information System and RAMIS/PC Workstation
Next meeting: October 1989, Phoenix
Top officer: Robert C. Forhetz, Monsanto
Relation to Vendor: Independent
Purpose: To exchange information about use of products
Services provided: One meeting per year; annual product enhancement survey **Note:** In addition to the international group, there are 12 independent regional RAMIS user groups in the U.S.

User groups must contend with the growing boom in mergers and acquisitions of information technology firms.

Vendor: On-Line Software International Inc.
Group Name: UFO-COBOL/XE International User group
Address: 2400 Washington Ave.
Newport News, VA 23607
Phone: (804) 247-8681
Annual fee: None
Individual members: 24,000
Corporate members: 2,000
Systems/products: UFO Productivity System and COBOL/XE
Next meeting: October 1989, place to be announced
Top officer: Stephanie Suttle, City of Newport News
Relation to Vendor: Partially subsidized
Purpose: To exchange information and ideas about use of products
Services provided: One annual meeting; annual survey for product enhancements

P

Vendor: Pansophic Systems Inc.
Group Name: No single group. User groups are organized by software products (e.g., TELON, CMF, and Applications Products) that cover Pansophic Manufacturing/38 and Pansophic Manufacturing for the AS/400; the PULSE group for a variety of productivity products; and the Graphics Products group.
Address: 2400 Cabot Dr.
Lisle, IL 60532
Phone: (312) 505-6000
Annual fee: Varies by group
Individual members: Varies by group
Corporate members: NA
Systems/products: Varies by group
Next meeting: NA
Top officer: Varies by group
Relation to Vendor: Independent
Purpose: To exchange information, learn about products, and influence product enhancement
Services provided: Regional and national meetings

Vendor: Primavera Systems Inc.
Group Name: Primavera Users Group
Address: 2 Bala Plaza
Bala Cynwyd,
PA 19004
Phone: (215) 667-8600
Annual fee: None
Individual members: 7,500
Corporate members: 5,000
Systems/products: Primavera software packages that run on IBM XT, AT, and PS/2, and on DEC VAX
Next meeting: Aug. 27-30, 1989, Philadelphia
Top officer: Joel Koppelman
Relation to Vendor: Fully subsidized
Purpose: To exchange information and learn about new management programs
Services provided: One annual meeting; quarterly newsletter

Vendor: Prime Computer Inc.
Group Name: National Prime Users Group
Acronym: NPUG
Address: P.O. Box 697
Laurel, MD 20707
Phone: (301) 490-2056
Annual fee: $25
Individual members: 2,000
Corporate members: None
Systems/products: All Prime systems
Next meeting: June 11-16, 1989, Anaheim, Calif.
Top officer: Patty Appel, Washington Dental Services of Seattle
Relation to Vendor: Independent
Purpose: To provide an organized means of communication among Prime computer users and between the users and Prime Computer; to provide an established forum for sharing ideas with Prime
Services provided: One national meeting per year; bimonthly newsletter

Vendor: Pyramid Technology Corp.
Group Name: Pyramid User Group
Acronym: PUG
Address: c/o Robert Wood Johnson Foundation
P.O. Box 2316
Princeton, NJ 08540
Phone: (609) 452-8701
Annual fee: $100 per organization; $25 per individual
Individual members: NA
Corporate members: NA
Systems/products: All products
Next meeting: March 1, 1989
Top officer: Dennis Grittner, City of Saint Paul Public Works Computer Services
Relation to Vendor: Fully subsidized
Purpose: To influence Pyramid's direction
Services provided: Annual meeting

R

Vendor: Recognition Equipment Inc.
Group Name: Cooperative Users of Recognition Equipment
Acronym: CURE
Address: 2701 E. Grauwyler
Irving, TX 75061
Phone: (214) 579-6000
Annual fee: None
Individual members: None
Corporate members: 5,620
Systems/products: All REI data capture systems
Next meeting: April 19-21, 1989, Dallas
Top officer: Stewart Kirchner, Data Entry Services Corp.
Relation to Vendor: Partially subsidized
Purpose: To learn about new technologies, productivity improvements, innovative applications, and coming enhancements; to exchange information and ideas with other users of REI systems
Services provided: One national meeting per year; quarterly newsletters

Vendor: Ricoh Company Ltd.
Group Name: MT User group
Acronym: MUG
Address: Chuo Building No. 22
2-11-8 Ginza, Chuo-ku
Tokyo 104
Japan
Phone: (03) 546-2705
Annual fee: Individual: 5,000; corporate: 20,000
Individual members: 3,000
Corporate members: 100
Systems/products: Ricoh personal computers
Next meeting: NA
Top officer: Haruo Ushio, Ushio Electronic Co. Ltd.
Relation to Vendor: Independent
Purpose: To exchange information among users and vendors of Ricoh's personal computers
Services provided: Quarterly newsletter

S

Vendor: SAS Institute Inc.
Group Name: SAS User Group Inc. (an umbrella group for approximately 60 regional, local, and corporate user groups)
Acronym: SUGI
Address: SAS Circle, Box 8000
Cary, NC 27512
Phone: (919) 467-8000
Annual fee: None
Individual members: NA
Corporate members: NA
Systems/products: SAS System, System 2000, Data Management System, and C products
Next meeting: April 9-12, 1989, San Francisco
Top officer: Richard LaValley, MCI Telecommunications Corp.
Relation to Vendor: Independent
Purpose: To discuss software applications, learn new techniques from other SAS users, and hear about research and development at SAS Institute
Services provided: One national meeting per year

Vendor: Shared Medical Systems Corp.
Group Name: SMS National User Group
Acronym: SNUG
Address: 51 Valley Stream Pkwy.
Malvern, PA 19355
Phone: (215) 296-6300
Annual fee: $200 for voting members; $35 for associate members
Individual members: None
Corporate members: 250
Systems/products: Independence software
Next meeting: March 29-31, 1989, New Orleans
Top officer: Dennis Dasanko, University of Wisconsin Hospital & Clinics
Relation to Vendor: Independent
Purpose: To provide mutual assistance and liaison between SNUG and SMS; to exchange ideas, information, innovations, and solutions among members; to promote resource sharing
Services provided: Two national meetings per year; periodic newsletters

Vendor: Siemens AG
Group Name: Siemens-Informationstechnik Anwenderverein e.V. (West German Siemens user group)
Acronym: SAVE
Address: Datenzentrale Schleswig-Holstein
P.O. Box 1780
D-2300 Kiel
West Germany
Phone: NA
Annual fee: DM700
Individual members: 1,300
Corporate members: 420
Systems/products: Siemens products and others; no exclusive products
Next meeting: April 18-21, 1989, place to be announced
Top officer: Hartmut Niesing, Kiel
Relation to Vendor: Independent
Purpose: To exchange experiences among users of Siemens information and communications systems, and to submit proposals to Siemens for future product development
Services provided: Three meetings per year; three publications per year
Note: There are also Siemens groups in Italy, Spain, Sweden, France, Switzerland, the Netherlands, Belgium, South Africa, and China.

Vendor: Software AG
Group Name: International Software AG Users Group
Acronym: SAGGROUP
Address: 11190 Sunrise Valley Dr.
Reston, VA 22091
Phone: (703) 860-5050
Annual fee: None
Individual members: NA
Corporate members: 3,000
Systems/products: All Software AG products
Next meeting: Oct. 22-26, 1989, Anaheim, Calif.
Top officer: Bill Wagner, University of Texas
Relation to Vendor: Partially funded
Purpose: To provide forums for exchange of technical information between users and vendor and among users
Services provided: One or two international meetings annually; quarterly newsletter

Vendor: Software Sciences Ltd.
Group Name: COLT User Group
Address: New City Court
20 Saint Thomas St.
London SE1 9RF
England
Phone: (44) 1-407-2717
Annual fee: None
Individual members: NA
Corporate members: 7
Systems/products: COLT
Next meeting: January 1989
Top officer: Bernard Harvey, Software Sciences Finance Systems
Relation to Vendor: Independent
Purpose: To discuss changes to and development of the COLT Market Making System
Services provided: Meetings

Vendor: Sterling Software Inc.
Group Name: DMS/OS User Group
Address: 11050 White Rock Rd.
Rancho Cordova,
CA 95670
Phone: (916) 636-1304
Annual fee: None
Individual members: NA
Corporate members: 300
Systems/products: Storage management products
Next meeting: April 16-19, 1989, San Antonio
Top officer: Frank Oleskewicz, Hartford Insurance Co.
Relation to Vendor: Independent
Purpose: To exchange information with other users of DMS/OS, and to provide recommendations to the developer for product enhancements
Services provided: One meeting annually

Vendor: Sterling Software Dylakor Div.
Group Name: Dylakor Users group
Address: 9340 Owensmouth Ave.
P.O. Box 2210
Chatsworth, CA 91313
Phone: (818) 718-8877
Annual fee: None
Individual members: 200-300
Corporate members: NA
Systems/products: All Dylakor products
Next meeting: April 16-19, 1989, San Antonio
Top officer: None
Relation to Vendor: Partially subsidized
Purpose: To exchange technical information
Services provided: One meeting per year

Vendor: Storage Technology Corp.
Group Name: StorageTek Forum
Address: 2270 S. 88th St., MS4355
Louisville, CO 80027
Phone: (303) 673-4732
Annual fee: None
Individual members: 188
Corporate members: 126
Systems/products: Large systems storage products
Next meeting: September 25-27, 1989, Denver
Top officer: Dean Boissoneau, Southern New England Telephone Co.
Relation to Vendor: Partially funded
Purpose: To enrich the partnership between StorageTek and its customers
Services provided: One annual meeting

Vendor: Sun Microsystems Inc.
Group Name: Sun Microsystems User Group Inc.
Acronym: SUG
Address: 2550 Garcia Ave.
Mountain View, CA 94043
Phone: (415) 336-4343
Annual fee: $30
Individual members: 5,586
Corporate members: NA
Systems/products: All Sun products
Next meeting: NA
Top officer: Dave Howard
Relation to Vendor: Partially subsidized
Purpose: To encourage the exchange of information between Sun users and Sun Microsystems Inc.
Services provided: One meeting per year; quarterly newsletter

Vendor: Systems Center Inc.
Group Name: Systems Center Users group
Address: 2477 Gateway Dr.
Irving, TX 75063
Phone: (214) 550-0318
Annual fee: None
Individual members: NA
Corporate members: NA
Systems/products: Network Data-Mover
Next meeting: June 4-7, 1989, Arlington, Va.
Top officer: NA
Relation to Vendor: Fully subsidized
Purpose: To enhance the product
Services provided: One annual meeting

T

Vendor: Tandem Computers Inc.
Group Name: International Tandem Users Group
Acronym: ITUG
Address: 111 E. Wacker Dr.
Chicago, IL 60601
Phone: (312) 644-6610
Annual fee: $300
Individual members: 2,300
Corporate members: NA
Systems/products: All Tandem products
Next meeting: June 11-14, 1989, Stockholm, Sweden
Top officer: Steven Moriarty, Panoramic Inc.
Relation to Vendor: Independent
Purpose: To advance the effective utilization of Tandem computers by promoting the free exchange of information concerning the use of such machines
Services provided: Two international meetings per year; bimonthly journal

Vendor: Tandy Corp.
Group Name: Tangent
Address: P.O. Box 17580
Fort Worth, TX 76102
Phone: (817) 390-3700
Annual fee: $100
Individual members: None
Corporate members: 240

Systems/products: All Tandy computer products
Next meeting: April 1989, Fort Worth
Top officer: John Esak, Nexus Inc.
Relation to Vendor: Independent
Purpose: To provide members with a forum for the exchange of ideas and to act as a liaison with Tandy Corp
Services provided: One national meeting per year; four newsletters
Note: Tangent consists of Tandy equipment business users. Tandy estimates that there are more than 200 other user groups, made up primarily of home computer users, computer enthusiasts, and small businesses that use Tandy computers. These groups are organized on the local level. Tandy sends a newsletter to as many of these groups as it is aware of.

Vendor: Texas Instruments Inc.
Group Name: Texas Instruments Mini/Microcomputer Information Exchange
Acronym: TIMIX
Address: P.O. Box 201897
Austin, TX 78720
Phone: (512) 250-7151
Annual fee: $40
Individual members: None
Corporate members: 6,000
Systems/products: All Texas Instruments computer products
Next meeting: April 1989, Dallas
Top officer: Rosemary Colgrove, Timex
Relation to Vendor: Independent
Purpose: To promote the exchange of information among users of Texas Instruments computer equipment
Services provided: One national meeting per year; monthly newsletters

Vendor: Thorn EMI plc
Group: CHAMPS User Group
Address: Meudon Ave.
Farnborough,
Hampshire, GU14 7NB
England
Phone: (44) 2-52-544-321
Annual fee: None
Individual members: NA
Corporate members: 200
Systems/products: CHAMPS Hotel System
Next meeting: Jan. 19, 1989
Top officer: David De Metz, Norfolk Capital Hotels
Relation to Vendor: Independent
Purpose: To facilitate the exchange of ideas and help move the product forward
Services provided: Meetings

Vendor: Trax Softworks Inc.
Group Name: Trax User Group
Acronym: TUG
Address: 10801 National Blvd.
Los Angeles, CA 90064
Phone: (213) 475-8729
Annual fee: None
Individual members: 2,000
Corporate members: 500
Systems/products: Trax software products and others that interface to Trax products
Next meeting: Feb. 27-March 1, 1989, Marina del Rey, Calif.
Top officer: Leo Hoyt, Caltrans
Relation to Vendor: Fully subsidized
Purpose: To learn about Trax products and their use; to help organize other user groups where they don't exist yet
Services provided: One annual meeting; quarterly newsletter

U

Vendor: Unisys Corp.
Group Name: CUBE Inc.
Address: P.O. Box 33053
Detroit, MI 48232
Phone: (313) 972-8698
Annual fee: None
Individual members: 3,000
Corporate members: 1,500
Systems/products: All Unisys products
Next meeting: April 17-20, 1989, San Francisco
Top officer: Eric Thomas, John C. Lincoln Hospital, Phoenix
Relation to Vendor: Independent
Purpose: To exchange ideas, techniques, and information; to propose modifications, changes, and additions to Unisys equipment and systems
Services provided: Two national meetings per year; newsletter

Vendor: Unisys Corp.
Group Name: Unisys Users Association/ABCU (with nine national groups, plus affiliations with groups in France and South Africa, and six common interest groups)
Acronym: UUA/ABCU
Address: Woodside, Over Lane
Baslow, Bakewell
Derbyshire DE4 1RT
England
Phone: (44) 24-688-3241
Annual fee: Varies by equipment
Individual members: None
Corporate members: 1,100
Systems/products: All Unisys products
Next meeting: April 3-7, 1989, The Hague, the Netherlands
Top officer: Frank Oschwald, RZAH, Switzerland
Relation to Vendor: Independent
Purpose: To exchange information between supplier and users and among users on matters of common interest; to stimulate cooperation between Unisys and users for the general good of users
Services provided: Two meetings per year in Europe; journal eight times per year
Note: In 1989, the ABCU group and the SUAE group (listed below) will be combined into one group to be known simply as Unisys Users Association.

Vendor: Unisys Corp.
Group Name: USE Inc.
Address: Box 461
Bladensburg, MD 20710
Phone: (301) 699-9336
Annual fee: $200
Individual members: None
Corporate members: 640
Systems/products: Unisys 1100/2200, 5000/6000/7000
Next meeting: April 1-4, 1989, Reno
Top officer: James T. Ault III, Creighton University, Omaha
Relation to Vendor: Independent
Purpose: To promote development and interchange of ideas and information concerning computers and computer science
Services provided: Two annual meetings; monthly newsletter

Vendor: Unisys Corp. International
Group Name: Unisys Users Association/SUAE
Acronym: UUA/SUAE
Address: Bakers Court
Bakers Rd.
Uxbridge, UB8 1RJ
England
Phone: (44) 895-37137
Annual fee: £75-£150
Individual members: None
Corporate members: 630
Systems/products: Complete Unisys product range
Next meeting: April 3-7, 1989, The Hague, the Netherlands
Top officer: B. R. Bachmann, Union Bank of Switzerland

Relation to Vendor: Independent
Purpose: To provide a forum whereby users may exchange ideas and information concerning all aspects of Unisys products and services, and present requirements for policy change and product development to Unisys
Services provided: Two conferences per year; periodic newsletters; periodic special reports

Vendor: Unix and Unix-like OS Vendors
Group Name: Usenix Association
Acronym: Usenix
Address: P.O. Box 2299
Berkeley, CA 94710
Phone: (415) 528-8649
Annual fee: Individual members: $40; educational institutions: $125; corporate entities: $275
Individual members: 2,800
Corporate members: Educational institutions, 350; corporations, 275
Systems/products: Unix and similar operating systems and the C programming language.
Next meeting: Jan. 30-Feb. 3, 1989, San Diego
Top officer: Alan G. Nemeth, Prime Computer Inc.
Relation to Vendor: Independent
Purpose: To exchange information and ideas about the various Unix systems and C
Services provided: Two meetings per year; bimonthly newsletter and quarterly journal

Vendor: Unix and Unix-like OS Vendors
Group Name: /usr/group (with 17 affiliated groups, five in the U.S. and 12 overseas. In its recently published UNIX Resources Guide, the group listed 50 independent Unix-specific user groups, and there may well be more)
Address: 4665 Old Ironsides Dr.
Santa Clara, CA 95054
Phone: (408) 986-8840
Annual fee: $100
Individual members: 4,500
Corporate members: None
Systems/products: All Unix systems
Next meeting: Feb. 28-March 2, 1989, San Francisco
Top officer: Donald O'Shea, Open Software Foundation
Relation to Vendor: Independent
Purpose: Forum for exchange of information concerning Unix and Unix-like operating systems
Services provided: One annual meeting; biweekly newsletter and magazine; Unix products directory; technical committees

W

Vendor: Wang Laboratories Inc.
Group Name: International Society of Wang Users
Acronym: ISWU
Address: One Industrial Ave.
Lowell, MA 01851
Phone: (508) 967-4322
Annual fee: $80
Individual members: 7,000
Corporate members: None
Systems/products: All Wang products
Next meeting: To be announced
Top officer: Bill Sturgen, Solar Turbine Inc.
Relation to Vendor: Subsidized
Purpose: To facilitate communication between users and vendor
Services provided: Two meetings per year; monthly technical publication

X

Vendor: Xerox Corp.
Group Name: EDGE International
Address: 6632 S. 191 Pl.
Kent, WA 98032
Phone: (206) 251-6010
Annual fee: $300
Individual members: 275
Corporate members: 225
Systems/products: All Xerox systems
Next meeting: April 30-May 4, 1989, San Diego
Top officer: Karen Alligier, Boeing Military Airplane Div.
Relation to Vendor: Independent
Purpose: To increase the usefulness of Ethernet and its devices
Services provided: Two national meetings per year; periodic newsletters and other publications

Z

Vendor: Zenith Electronics Corp.
Group Name: Heath/Zenith Users Group (an umbrella organization with more than 100 local user groups under it)
Acronym: HUG
Address: P.O. Box 217
Benton Harbor, MI 49022
Phone: (616) 982-3463
Annual fee: $22.95 first year, $19.95 thereafter
Individual members: 17,000
Corporate members: None
Systems/products: Heath and Zenith computers
Next meeting: HUG has no meetings, but local user groups do.
Top officer: Margaret Bacon, Heath
Relation to Vendor: Fully owned
Purpose: To foster the exchange of information
Services provided: Monthly magazine

Nick Downes

"Hadn't we ought to be getting on with the case, Holmes, rather than burning insects?"

Quarterly Update: Datamation/Price Waterhouse Opinion Survey

Hardware and software spending is likely to rise, but personnel spending definitely won't.

BY NORMAN STATLAND

The most recent quarterly survey of information technology executives on the DATAMATION/Price Waterhouse Opinion Panel reveals that a consistent majority are planning increases in expenditures for hardware and software over the next year.

Nevertheless, the number of those planning increases in hardware spending has fallen dramatically since the first DATAMATION/Price Waterhouse survey, conducted in late 1987. Then, more than 60% were going to increase hardware spending. The most recent survey showed that 49% would increase the amount of money spent by their company on hardware over the next 12 months; 39% indicated that hardware spending would stay the same, up from the 32% who said they'd hold spending steady in late '87.

Analyzing the funds spent on the purchase of application software, 43% of the companies said that they would increase the spending, while 45% said that they intend to keep it the same. Leaders in plans to increase spending include process manufacturing, government, and other manufacturing.

In contrast to these increases in expenditure for both hardware and software, increases in the number of systems and programming staff were expected for only 33% of the reporting organizations, a slight drop from the 1987 survey. More than half, 56%, expect to keep staff levels the same. Uniquely, 42% of companies with 5,000 to 10,000 employees expect an increase, almost 10% higher than the average for the respondents. The only sector with significant plans to decrease staff was the computer services group.

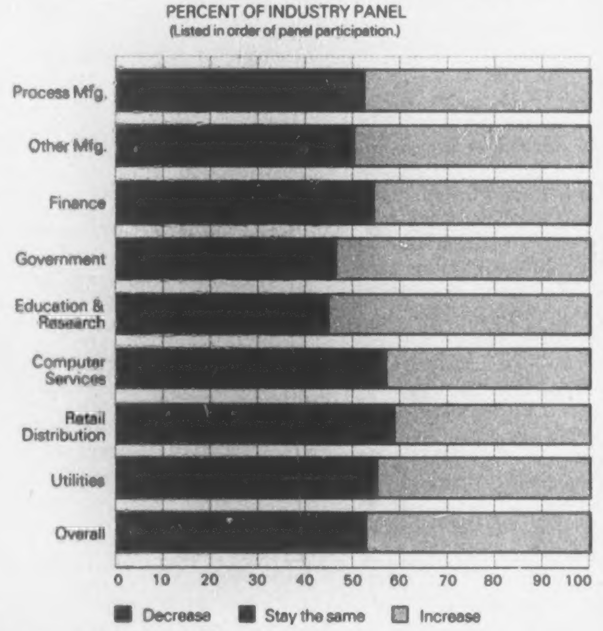
(Overall, increases in the number of systems and programming staff were most noticeable at DEC and Unisys installations, while the largest increases in telecom specialists were at H-P and DEC installations.)

Half of the respondents said they expect to increase salaries by less than 5%; only 39% said they would increase salaries by 5% to 10%. The industry sectors that expect to lead in giving increases were process manufacturing and finance.

Though the issue of decentralization is still hot, fewer than 50% of the respondents said they expect to increase spending on decentralization. But an almost equal number said they will maintain spending at current levels. About two-thirds (67%) of companies with between 5,000 and 10,000 employees said they expect to further implement user-controlled hardware, software, and IS staff to facilitate distributed data processing.

Spending on Decentralization by Industry

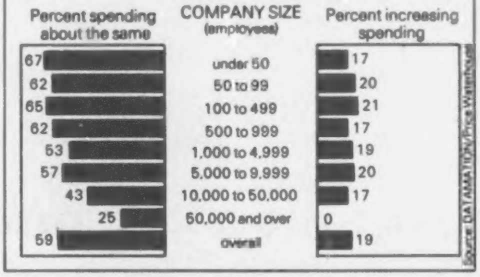
The decentralization heat is being turned up everywhere.



Source: DATAMATION/Price Waterhouse

Outside Services Spending by Company Size

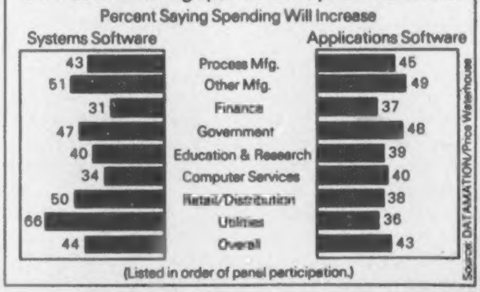
Big firms are the least likely to use outside services.



Source: DATAMATION/Price Waterhouse

Software Spending by Industry

Utilities are the big spenders in system software.



(Listed in order of panel participation.)

Source: DATAMATION/Price Waterhouse

Charts by Paragraphics

A CAHNERS PUBLICATION
INTERNATIONAL EDITION JANUARY 1, 1989

EXCLUSIVE: An Interview With IBM Chairman John F. Akers

DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

The Rise of an Information Utility

IBM Wants to Satisfy Every IS Need... Will Users Plug In?

Also in this issue:
- Dialing for PC Software Support
- Managing Computer Security
- Networking: An Alternative to NFS

JAN 1, 1989

VOLUME 34
NUMBER 26

DATAMATION®

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

The Rise of an Information Utility 26

BY RALPH EMMETT CARLYLE AND JEFF MOAD The revamped, reorganized, redeployed IBM attempts to be all things to all users: Ultimate Consultant, Premier Integrator, Super Service Company—perhaps the world's first Information Utility? The costs and benefits to users of plugging into this SAA-grounded utility are hard to calculate, yet fundamentally simple: IBM will provide them with the high-level business interfaces they seek in exchange for being given the role of technical manager and business consultant/integrator.

Cover Photography by Walter Wick

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IBM Redefines the Competition 37

BY GARY McWILLIAMS AND SUSAN KERR IBM's push into value-added services, systems integration, and consulting adds EDS, Arthur Andersen, and Price Waterhouse to Big Blue's crowded field of competitors. Their struggle is for nothing less than the hearts and minds—not to mention budgets—of IS users intent on creating integrated computing environments dedicated to running their businesses.

How One Contract Was Structured 38

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BY BOB FRANCIS AND WILLIE SCHATZ Big Blue is relying on third-party software developers and resellers to help it bring solutions to certain markets and to carry off its Systems Application Architecture strategy. But can it really support indirect sales?

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All Things to All Customers 46

BY RALPH EMMETT CARLYLE AND TIM MEAD IBM chairman John F. Akers wants his company to compete in nearly every corner of the world's IS business, he tells DATAMATION in an exclusive interview. If it means going against established systems integrators like EDS, fine. If it means settling for just a piece of the action, that's okay, too.

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Dialing for HELP 53

BY EDWARD J. JOYCE As the PC software field narrows, customer support is becoming more competitive as users demand better, faster, and more service than ever before. The telephone hot line is becoming a major weapon in software competition.

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The Great Australian Tax Deal 59

BY NORMAN KEMP Four mainframe system vendors are vying for a $600 million nationwide tax automation project, Australia's largest systems integration deal ever. The project entails linking large and disparate financial databases via the mainframes and 10,000 workstations.

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BY SUSAN KERR IBM is expending a considerable amount of money and development energy to bring its Unix-based distributed computing system—the Andrew File System—into the commercial world to vie with the industry-standard Network File System.

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Managing Computer Security 67

BY ALI F. FARHOOMAND AND MICHAEL MURPHY A recent survey of Fortune 500 companies has found that while major industrials are very concerned about security, they are not necessarily practicing what their security officers are preaching. There is a lot of room for improvement, especially in the realm of personnel security.

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INTERNATIONAL

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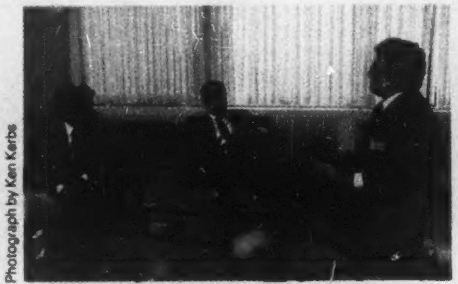
Is the New IBM Listening to You?

January 1 has become an important date on DATAMATION's editorial calendar. For the past four years, it has been the date of the issue in which we feature an in-depth examination of IBM. In a world of emerging standards, vast information networks, and all-encompassing architectures, knowing what the world's largest IS supplier is doing, and why, is crucial for users of information technology products and services.

Over the past several years, IBM has gone through a metamorphosis. Internal reorganization and redeployment, revamping of its three major product lines, and the introduction of SAA have combined to fashion a new company, one trying to be intently focused on the customer and the market. And so, DATAMATION has applied the power of its entire writing staff—nearly 100 years of combined computer industry editorial experience—to bringing into focus the identity and mission of IBM.

In September, we began the process with a two-day editorial meeting of 12 writers and editors. This meeting was followed up by five international conference calls among the staff even as the process of reporting—including interviews both by phone and in person with IBM executives and scores of IBM customers and analysts—took its course. The result: a four-part series that puts into perspective what IBM is doing, how it is doing it, and what it means for you, the user.



Photograph by Ken Kerbs

IBM CHAIRMAN AKERS (center) with DATAMATION's Carlyle (left) and Mead.

The first article in the series, "The Rise of an Information Utility," p. 26, is an analysis and interpretation of the new IBM and its attempt to become the all-encompassing provider of IS products and services. Teaming up on this article were Ralph Emmett Carlyle, a 12-year DATAMATION veteran known for his powers of synthesis, and Jeff Moad, who for the past 10 years has been reporting on the computer industry (the last three as DATAMATION's San Francisco bureau chief) and whose abilities as a writer are matched only by his relentlessness as a reporter. What they've come up with, we think you'll agree, is perhaps the most penetrating analysis of IBM to be found. Next is an analysis of the competition; how Big Blue's activities as partner, systems integrator, project manager, etc., stack up against the likes of EDS, Unisys, Arthur Andersen, and others. San Jose bureau manager Susan Kerr, a five-year industry veteran who joined DATAMATION in 1986 and is known for cutting to the heart of an argument; and Gary McWilliams, who, with nearly nine years of industry experience, is the dean of New England-based computer journalists, joined to reveal the hands of the other players and the attitudes of customers toward the new IBM.

The third part of our series covers what for IBM is a critical part of its market strategy—third-party software developers. It was written by Dallas bureau chief Bob Francis, who joined DATAMATION last year, and by Washington bureau manager Willie Schatz, an eight-year DATAMATION editor, and six-year veteran international editor Paul Tate; the latter two report on IBM's intellectual property protection activities and overseas partnerships, respectively.

We wrap up with an exclusive interview with IBM chairman John Akers, who tells editor-in-chief Tim Mead and senior writer Carlyle the IBM message: that IBM is listening to customers and will provide them with what they want and need.

After you finish reading our IBM report, you make the call. Is IBM listening to you? Are you getting what you need to run your business? And then take a moment to let us know, either by letter or by phone, your judgment on the new IBM.

—David R. Brousell, Executive Editor

DATAMATION®

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Managing Computer Security

Everyone is concerned about security, but firms don't always practice what their security officers preach. A recent survey of Fortune 500 companies reveals there is room for improvement, especially in the personnel security department.

BY ALI F. FARHOOMAND AND MICHAEL MURPHY

Amidst a lip-service overload about PC proliferation and computer security, few empirical studies have been made of computer fraud, crime, and abuse, computer security control and audit, and the cost of security. The few studies that have been performed have not compared the way firms actually manage their computer security with the way they admit they should.

Recently, we surveyed the Fortune 500 firms to gain insight into the nature of various elements of computer security management. An attempt was made to investigate relationships between the prevailing computer security problems and the size of a company's information systems facilities, as measured by the number of MIS employees and the annual budget of the MIS department.

The surveys were mailed to computer security officers or MIS managers of all the Fortune 500 companies. The questionnaire inquired about various aspects of computer security. Within six weeks, 88 out of 500 surveys were returned, and 86 were deemed usable. The response rate (17.2%) appeared reasonable in light of the sensitive nature of the topic.

The median number of employees in the surveyed MIS departments was found to be approximately 150 people. The median annual MIS budget of the responding companies was estimated to be approximately $20 million. More than half of the respondents allocate less than 0.5% of this to computer security; about a third allocate between 0.5% and 1.0%; and the remaining companies allocate over 1.0%.

For questions of policy direction, standards and procedures, and areas of responsibility, the surveyed firms usually have comprehensive guidelines in place. More than three quarters of the firms have documented emergency, backup, and recovery plans. However, approximately one third of the firms never test these plans, nor do they reevaluate security programs at specified intervals.

Policies are generally formulated by consultation between the MIS manager and top management. Before computer security policies can be adopted, final approval must be obtained from senior management. This involvement in both policy formulation and approval can be viewed as a definite sign that top management provides a high level of support to the computer security program.

Personnel Security Weak

Personnel security programs were found to be weak: companies do not generally do a good job of checking up on employees once they have begun to perform their duties. In particular, firms do not:

- use attitude surveys to monitor the level of employee morale;
- consider an employee's level of security consciousness during his/her performance assessment;
- use job rotation as a means of evaluating an employee's security-related behaviors;
- use the regular vacation of a key employee to perform a mini-audit of that employee's work; and
- identify employees whose particular responsibilities make them potential security risks.

To understand why firms have not adopted these measures, it is instructive to examine the relationship between employees and the personnel department. At the pre-employment stage, background investigations and reference checks of prospective employees are performed as a matter of course; pre-employment agreements are signed with new employees; and new employees are formally notified of their security responsibilities. This interaction facilitates the personnel security program. During the post-employment

Illustration by Karen Stolper

stage there is again a substantial amount of contact between personnel officers and departing employees. However, during the employment stage of the employment cycle, the survey shows that most elements of the personnel security program are neglected by the majority of firms.

Security training is another weak area in the personnel security program, with 52% of firms making no provision for any form of employeee security training.

Slightly more than half of the firms have developed asset-threat inventories—inventories that address what safeguards will protect their assets against predetermined threats. The most commonly used measures that firms employ to rank identified threats are expected loss, frequency of occurrence, hours of downtime, and dollars of damage.

The rest of the firms neither perform any risk assessment of security threats nor do they formally identify and evaluate their computer assets. Subjective methods of risk assessment are more widely employed in identifying assets and evaluating potential threats than such quantitative methods as the Delphi technique or Threat Model (an analysis tool for identifying security threats that is based on cause and effect relationships). As one of the respondents commented, "Risk analysis need not be performed to know that software security systems are required. In fact, such analyses only prove what is already known and, thus, amount to wasted time and effort."

Problems Affecting Computer Security

Computers are KO'd by man and nature.

PROBLEM	% FIRMS AFFECTED
Utilities failure	80.8
Inadequate control	75.6
Compliance failure	73.1
Improper guidance	67.9
Enviroment support breakdown	64.1
Electromagnetic discharges	43.6
Liquids	29.5
Electronic intrusion	29.5
Fraud and embezzlement	16.7
Gases	11.5
Extreme temperature	11.5
Physical intrusion	10.3
Service loss	7.7
General violence (vandalism)	7.7
Specific violence (sabotage)	6.4
Living organisms	2.6
Projectiles	2.6
Earth movements	1.3

Source: Ali F. Farhoomand

Security Officers' Views

Although there is a general congruence between how firms manage computer security and how their security officers feel computer security should be managed, some differences were reported. Particularly in the area of personnel security, the respondents felt that their firms are failing in two important areas: providing some form of security training for MIS employees and identifying employees whose particular responsibilities make them potential security risks.

In addition, there are a series of minor differences between the views of security officers and the firms' practices in the area of asset-threat inventory. Most of these differences relate to either the formality of the analysis and control procedures or the importance of applying certain security programs. For the most part, the firms use subjective estimates made by people who are familiar with the assets, while security officers prefer using estimates based on the cost created if the asset were unavailable for a specified time period.

Overall, security officers feel that still more can be done to enhance the level of computer security within their firms, and they recommend applying more formal analysis and control procedures to security programs, as well as increasing the frequency of certain security procedures.

The problems that have affected the largest number of firms are summarized and shown in "Problems Affecting Computer Security." The costliest are utilities failures, according to 36% of the firms; compliance failure, in 33% of the firms; and improper guidance, in 21% of the firms. These findings suggest that the often publicized threats such as computer hackers and other white collar criminals have had either little or no effect on the majority of firms, or are not being reported.

Ali F. Farhoomand is an assistant professor of MIS at Concordia University in Montreal. Michael Murphy is a systems engineer with Canadian National in Montreal.

A Computer Security Framework

We based our Fortune 500 survey of computer security management techniques on the Total Computer Security Concept that was presented by L.H. Fine in *Computer Security—A Guide for Management* (Heinemann, London, 1983). Fine divides the issues related to the computer security architecture of a company into two categories: management issues and technical issues. The management issues ultimately are the responsibility of senior management, while the technical issues are clearly the responsibility of MIS management.

The technical issues surrounding a firm's computer security are threefold: physical security, controls, and system security. The issues that concern management fall into five categories:

A defined and documented computer security policy. This specifies the scope and direction of the company's involvement in computer security.

Standards and procedures. These are the detailed, day-to-day guidelines that should be followed during any type of MIS operation or activity. They are designed to help protect the firm's computing assets from most security threats.

An outline of responsibility for computer security. This involves division of responsibility among the computer security function, the MIS department, the personnel department, and top management.

A personnel security program. This includes employees' entire employment cycle, from pre-employment to post-employment. This program should also address such areas as pre-employment screening, condition of employment agreements, security training, employee morale, and employee termination procedures.

A complete asset-threat inventory. This provides a set of safeguards designed to protect a firm's computing assets against a group of predetermined potential threats. The inventory includes: identification and valuation of the assets; identification of the potential threats; risk assessment process; identification of the potential safeguards; selection of safeguards; adoption of contingency plans; testing of contingency plans; auditing of the computer system; and ongoing computer security evaluation.

Fine's Total Computer Security Concept can be envisaged as a horizontal beam supported by eight pillars: the five management issues and the three technical issues. This beam supports the integrity and confidentiality of the firm's information systems.

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A CAHNERS PUBLICATION

JANUARY 15, 1989

DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

Hot Technologies for the New Year!

Expert Systems, LANs, CASE, and Imaging Systems Heat Up User Environments

Also in this Issue:
The Evolution of Telecom Pros
The Long Road to DB2 Migration
Soft Landings for RISC Systems
Gauging Decision Support Benefits

JAN 15, 1989
VOLUME 35
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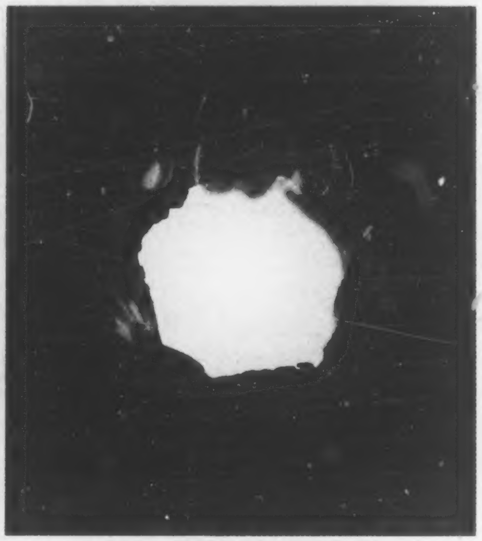

Hot Technologies for 1989 18

BY LINDA RUNYAN Expert systems and local area networks are the projects IS execs will feverishly pursue in the year ahead. Capturing expertise in an economical form is the chief motive behind their AI investments, while connecting PCs and workstations to corporatewide systems spurs their LAN purchases. Outlays for imaging systems, optical storage, OLTP applications, and CASE tools are also heating up. Interest in packaged software and IBM's SAA, however, remains lukewarm.

Cover Photography by Walter Wick

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The Long Road to DB2 Migration 29

BY JANETTE MARTIN IBM does not encourage migration from IMS to DB2, but users on both sides of the Atlantic plan to do just that. Although the migration path is tortuous and expensive, products that could make it easier are emerging.

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Soft Landings for RISC Systems 35

BY GARY McWILLIAMS Compared with the transition from 16-bit CISC architectures to 32-bit, the move from CISC to RISC appears to have fewer hurdles. To smooth customers' change to RISC systems, vendors are combining existing Unix OSs and, in some cases, applications.

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BY BRAD SCHULTZ A movement to interconnect now separate electronic mail systems via X.400 gateways is gathering steam at corporations. Key considerations facing IS managers are multivendor computing environments, deciding between in-house and external e-mail systems, and the impact of IBM's recent announcements.

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Telecom Pros Evolve 45

BY SUSAN KERR In today's network age, the integration of voice and data demands hiring professionals who have more than just telephone experience. A new breed of telecommunications professional is evolving, and in most cases, he or she is emerging from the computer department.

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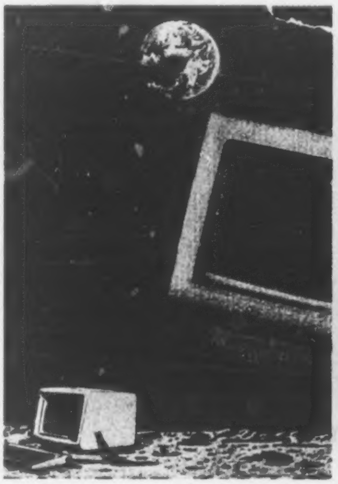
The Benefit of Quality IS 53

BY EDWARD RIVARD AND KATE KAISER Contrary to popular belief, several methods exist for identifying the intangible, qualitative benefits of today's sophisticated decision support-oriented systems and for presenting their potentially significant impact to management.



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INSIDE DATAMATION

Acting On Intelligence

Timing isn't everything in IS life, but it certainly accounts for a significant number of successes and failures in implementing new technologies. Early adopters of innovative products and techniques often gain ground in market share that competitors find difficult to recapture. Conversely, IS execs who leap uninformed into new, untested technologies usually pay stiff penalties—cost overruns, poor morale, etc.

Technology choices, consequently, carry far greater weight than many other corporate exercises. That's why we turned to senior editor Linda Runyan to head up our annual effort at assessing where leading users in different business segments are putting their technology dollars. Her dozen years at DATAMATION counted heavily when we evaluated the evidence that she and her band of reporters uncovered regarding the application of AI by major user organizations. "You're not going to believe it, guys," Runyan exclaimed after poring over reports from Mary Jo Foley, Michael Leibowitz, and Kurt Rothschild, who had fanned out to determine what IS execs in a dozen industries had on their technology drawing boards for the new year, "but AI is the story for 1989."

For years, AI vendors have been promising that the next growth spurt for their industry was at hand. So, claims that any branch of AI would blossom in 1989 would have been treated skeptically had they come from a lesser known source than Runyan, who has seen many technology plants thrive and die. She finds, however, that AI applications have left the vendors' greenhouses and started to crop up at transportation companies, chemical manufacturers, utilities, oil companies, and insurers.

Photograph by Kevin Kerbs

TECHNOLOGY TWEAKER Runyan measures AI stakes in '89.

Despite the endorsement of Norfolk Southern, Combustion Engineering, Southern California Edison, Shell Oil, and other AI users, the technology requires careful and patient management, Runyan cautions. Several of the expert systems users she examines are in the pilot—not production—stage. That's why, she reasons, so few users have put AI outlays into their normal IS budgets for 1989.

Networks, on the other hand, have found their way into the mainstream of corporate information technologies. Networks, along with computer-aided software engineering, imaging systems, and optical storage, hold significant potential for improving office productivity and for creating new business opportunities. All the more reason to warm up to "Hot Technologies for 1989," on page 18.

Technology Transitions Don't Have To Be Hard

Relational database management and reduced instruction set computing, two other technologies of critical importance to companies, are the subjects of two additional articles in this issue.

Corporate data held in relational form will grow from an average of about 7% of all data in 1988 to over 45% by 1993, predicts one industry savant. "The big question," he says, "is how to get there." Our Italy-based correspondent Janette Martin discovers the ways in which at least some European users of IBM's hierarchical database technology are planning to make the trip in "The Long Road to DB2 Migration," on page 29.

Travel of a different sort draws the attention of Boston bureau manager Gary McWilliams in "Soft Landing for RISC Systems," on page 35.

Tim Mead

—Tim Mead, Editor-in-Chief

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Take a Letter, Mr. Postman

A movement to interconnect now separate electronic mail systems via X.400 gateways is gathering steam with IS managers facing several key considerations.

BY BRAD SCHULTZ

Illustration by Tim Grajek

"What you're seeing now is the swelling of the wave approaching the beach," says Einar Stefferud, a consultant with Network Management Associates, from his office in Huntington Beach, Calif., near the site of the U.S. surfing championships. "A wave of new X.400 products will crest and crash on the beach in 1990."

And it won't be because of the moon and the tides. A number of trends are conspiring to bring about the push for X.400 compliance. Chief among them is usage. Industry estimates show double-digit growth rates for both the number of mailboxes being created and the number of messages being sent per month. Add to this the number of e-mail users employing both internal and public e-mail services, and it's not difficult to see why vendors are flocking to the X.400 standard.

For IS managers with heavy responsibilities for e-mail within and between sizable organizations, the message is clear: you should now be participating in the development of a corporate strategy for implementing an X.400-conformant backbone network.

The first steps in formulating this strategy, say Stefferud and others, is to evaluate what your e-mail needs are and how they are likely to grow. Know the capabilities of the systems you are currently using and determine how much of your existing e-mail traffic is not X.400-conformant.

It may be some comfort to know that virtually all major vendors of products and services that might serve as elements of an e-mail operation have at least formally endorsed X.400, and that some companies already run a significant portion of their e-mail through X.400-conformant networks.

Says Douglas Brackbill, director of MCI Mail's advanced product marketing, "As a standard for exchanging messages between systems, X.400 expedites the interconnection process. It eliminates the need for special development and support for each pairwise interconnection. It provides the platform for worldwide messaging and information interconnection."

The Role of X.400 Gateways

To interconnect separate, coexisting e-mail systems, commercial companies around the world employ or will employ gateway products and services that translate e-mail from proprietary to other proprietary or X.400 formats. At many companies, X.400 gateways run or will run at the junctions between e-mail resources conformant to X.400 and e-mail resources conformant to a proprietary network architecture that is incompatible with X.400.

☐ X.400 GATEWAYS MAY OBVIATE THE NEED FOR SEPARATE MESSAGE-HANDLING GATEWAYS.

X.400 gateways may gradually obviate the need for separate message-handling gateways between proprietary network architectures, Stefferud notes. For example, a company may eliminate gateways between its IBM mainframes and DEC VAX units by configuring an X.400 backbone network from all of these systems, or from some of them, while establishing gateways between the backbone network and systems the network does not include. By minimizing the volume of e-mail that must run through systems not included in its X.400 backbone network, a company may minimize the cost, performance drain, and reliability risks that are imposed

A Sample of Some E-Mail Suppliers

AT&T (AT&T Mail)
55 Corporate Dr.
Bridgewater, NJ 08807-6991
(201) 658-6000
Circle **150**

CompuServe
5000 Arlington Centre Blvd.
Columbus, OH 43220
(614) 457-8600
Circle **151**

Dialcom Group
6120 Executive Blvd.
Rockville, MD 20852
(301) 881-9020
Circle **152**

GE Information Services
401 N. Washington St.
Rockville, MD 20850
(301) 340-4000
Circle **153**

McDonnell Douglas (OnTyme)
20705 Valley Green Dr.
Cupertino, CA 95014
(800) 435-8880
Circle **154**

MCI International (MCI Mail)
2 International Dr.
Rye Brook, NY 10573-1098
(914) 937-3444
Circle **155**

The Source
1616 Anderson Rd.
McLean, VA 22102
(703) 734-7500
Circle **156**

Telenet Communications Corp./U.S.
Sprint (Telemail)
12490 Sunrise Valley Dr.
Reston, VA 22096
(703) 689-5700
Circle **157**

Western Union (Easylink)
1 Lake St.
Upper Saddle River, NJ 07458
(201) 825-5000
Circle **158**

by gateway utilization.

Analysts say that IBM's announcement last September of products conformant with X.400 and other Open Systems Interconnection (OSI) protocols ensures eventual widespread acceptance of the X.400 approach to e-mail networking by the world's commercial IS community. X.400 is considered the first of several protocol standards for the top layer of the seven-layer OSI model—the application layer, where information services are provided to support end-user tasks such as file transfer, remote file access, database management, and communications between applications.

IBM also made clear its determination to support both Systems Network Architecture (SNA) and X.400 approaches to e-mail by its September announcement of Open Systems Message Exchange (OSME), a software package (scheduled to become available last month in VM and MVS versions) that would route messages between SNA-conformant IBM systems and other vendors' X.400-conformant systems.

At the same time, IBM said that it would make available later this year an enhanced version of its X.400 Interpersonal Message Services (IPMS) that would let IPMS users exchange messages with users of the IBM Information Network's ScreenMail Service.

OSME may be ordered with modules called X.400 PROFS Connection and X.400 DISOSS Connection, which would convert the formats of messages constructed under IBM's Professional Office System (PROFS) and Distributed Office Support System (DISOSS), respectively, into the X.400 message format, and vice versa.

PROFS is the most widely used e-mail system in IBM mainframe environments. While PROFS-involved IS managers say that they are far from satisfied with the aging VM-supported system and want to minimize SNA-dependent e-mail operations, they all say that it and DISOSS will probably be running at their companies well into the 1990s.

Running on an IBM 9370, a program offering called PROFS Extended Mail lets a large California aerospace company exchange messages between SNA environments and the Internet, the world's foremost network of research-oriented computer networks. The Internet was spawned by and is now absorbing ARPANET, where computer-based e-mail began (see "The Evolution of ARPANET," Aug. 1, 1988, p. 71).

Although this aerospace company is "about 60% Big Blue," according to an IS manager who requested anonymity, the PROFS Extended Mail gateway is crucial because thousands of users in the company, like most Internet users—including major contributors to the development of X.400 and X.400 gateways—depend heavily on SNA-incompatible, Unix-based e-mail systems.

"Our whole strategy with X.400 is to use it for intercompany e-mail within the aerospace industry," says the IS manager, whose company has about 15,000 e-mail users. "Because X.400 is not proprietary, it does not lock us into any particular vendor." He adds that X.400's scheme for specifying e-mail addresses is advantageous.

☐ IBM WILL BE SUPPORTING BOTH SNA AND X.400 APPROACHES TO E-MAIL VIA ITS OSME SOFTWARE.

The Inadequacy of Eight Characters

IS managers using PROFS tell DATAMATION that the PROFS convention of specifying an e-mail address in terms of just eight characters for a user name and another eight characters for a site name is quite inadequate for their purposes. A primary benefit of PROFS Extended Mail is that it can convert a 16-character PROFS address into an address of the greater length required in huge networks like the Internet.

"It is a travesty that IBM would ever decide to market [PROFS]," remarks the aerospace company IS manager. He adds, "Of all the major e-mail systems on the market today, PROFS is probably the worst from a user-friendliness standpoint." Yet, he concedes, "there is a lot of functionality in it. If you're willing to put up with the product's user-viciousness, you can get a lot of work done. I couldn't do my job without it."

Vendors, too, are preparing themselves for when the new IBM products become available. According to Miles Morimoto, X.400 product manager for Telemail, the public e-mail service of U.S. Sprint's Telenet Communications Corp., Telemail has been offering a gateway package similar to the X.400 PROFS Connection, but will ensure that Telemail services are fully compatible with that OSME option.

He says that Telemail, through various products and services, has already brought a number of large organizations into X.400 conformance, including Boeing Co., Northrop, the Federal National Mortgage Association, the U.S. Forest Service, NASA, and the postal, telephone, and telegraph authorities of several nations.

However, getting the job done and ensuring conformance has become more complex than ever. Today, the demand of users to interconnect dissimilar systems must be met. One company that has risen

Yes, There Are Many Messages in His Bag for You

U.S. public network e-mail services showed strong growth between 1987 and 1988.

Electronic Mail Service	Active Mailboxes (as of June 1988)	Messages Per Month (in millions)	1987 Total Revenue (in millions)
Western Union (EasyLink)	175,000	7.5	$83
U.S. Sprint (Telemail)	165,000	4.8	50
Dialcom Group (U.S.)	140,000	3.8	37
CompuServe (InfoPlex & CIS)	450,000	3.3	33
MCI Mail	100,000	1.8	20
GE Information Services (Quik-Comm & GEnie)	150,000	1.6	20
AT&T Mail	40,000	1.7	17
McDonnell Douglas (On Tyme)	50,000	1.1	15
The Source	60,000	.25	3
Others	155,000	1.05	9
TOTAL	1,485,000	26.9	$287
Annual Growth Rates (based on 16-month period from March 1987 to July 1988)	16%	25%	20%

NOTE: This table lists the nine largest publicly available electronic mail networks in the U.S. It counts only U.S. subscribers, and therefore does not include Canada, which is an 80,000-user market. Growth rates are for U.S. only.
Source: International Resource Development

to that challenge is Hughes Aircraft, a General Motors subsidiary.

At Electronic Messaging '88, the latest annual Electronic Mail Association (EMA) conference, held last October, Hughes IS manager Peter W. Donaghy described how e-mail systems are deployed in multivendor computing environments at his company's 32 locations.

These systems route messages across a packet-switched (X.25) network Hughes Aircraft built for itself, across SNA-conformant networks, across DECnets and Ethernets configured from Digital Equipment Corp. products, and across local area networks supplied by 3Com, Novell, Banyan, and Apple Computer, according to Donaghy. He went on to explain that more than 10,000 of the company's 22,000 e-mail users are served by DEC VMS Mail and All-in-1, running on more than 200 DEC computers. About 7,000 users are served by 10 PROFS implementations.

All of this diversity in proprietary e-mail systems forces Hughes Aircraft to run a lot of message format translations at gateways. According to Donaghy, message-handling gateways between the IBM systems and other e-mail systems perform more than 2,400 translations per month, while gateways between e-mail systems hosted by 15 Hewlett-Packard Co. computers and other e-mail systems translate more than 1,200 messages per month. Gateways between the DEC e-mail systems and other systems translate in excess of 600 messages per month.

Gateways between PC Office, an e-mail system the company developed for itself, and other systems translate more than 780 messages per month, while gateways between MCI Communications' telex service and other systems translate more than 720 messages per month. All told, the number of message translations performed at Hughes Aircraft's gateways exceeds 5,700 and is growing fast, Donaghy said.

The Desire for Interconnection

"It's obvious that organizations using electronic mail have seen an extraordinary boom in usage and a demand from employees across various departmental lines for companywide interconnected messaging," says Michael Cavanaugh, executive director of the EMA.

"We heard a good deal about the initiatives that are being taken by representative organizations at Electronic Messaging '88," he continues. "Beyond achieving reach within the corporate structure, individuals now want an interconnection to at least one public messaging service to establish communications with suppliers, vendors, consultants, etc., as well as to gain access to telex, hard-copy delivery, terminal-to-fax, etc."

☐ WESTERN DIGITAL IS MOVING TO STANDARDIZE ON A SINGLE SOFTWARE PACKAGE.

Adds Rhonda Carlson, office automation manager for Western Digital, Irvine, Calif., "On my wish list for 1989 is universal messaging among public e-mail service vendors. The subject of interconnecting messaging systems using X.400 was addressed at the EMA conference. We heard a lot of talk, but have seen little action."

Carlson says that her company is fortunate in being able to standardize on a single computer architecture, DEC VAX, for its e-mail system hosts, and is even moving to standardize on a single e-mail software package, DEC's All-in-1. Despite the extent of its internal standardization, Western Digital desires tools for interconnecting its e-mail systems with those of the organizations that correspond with the company, she emphasizes.

Before they interconnect various e-mail systems, many organizations have to decide whether to develop their own e-mail service or use a service from an outside source. One expert in the field, former MCI Mail president J. Robert Harcharik, now a semiretired consultant based in Hilton Head, S.C., favors in-house e-mail development.

"They might try e-mail externally for a short time," Harcharik says, "and if it sells inside their organizations, they should go in-house. The economics are overwhelming.

"But here is where the same people really miss the boat," he points out."They should connect the in-house systems to a service, so that mail can be transferred between their own in-house systems and between their systems and those of their suppliers, customers, etc. Not to mention that such interconnection would give them telex, overnight courier letters, postally delivered letters, and now fax on every user's desk."

Harcharik stresses the "staggering" advantages and value of interconnected systems. "The ability to communicate with people outside your organization as fluidly as you can with those inside is super," he says. "But folks don't ever think to seek this ability, probably because they couldn't imagine it being there. In fact, all they need to do is connect the in-house system to the carrier service.

"E-mail carriers are the postal service, not the mail room," he continues. "They should carry mail intercompany, not intracompany. Really small businesses have to use a service."

But much to Harcharik's regret, those small businesses haven't realized "the value of being able to send messages via overnight letter, fax, and telex from their PC. They, being small single operators, don't communicate with many people on the same service as they are; therefore, if they miss the ability that systems like MCI can give them to communicate in these other media, they miss the entire reason why someone gave them e-mail."

IS manager John J. Alexander Jr. of the Portland, Maine-based Union Mutual Life Insurance Co., where most employees use

PROFS, also regards the decision to implement in-house or public e-mail as an economic decision.

"When a firm is small [either because it's just starting or is naturally that way], an external source can offer economies of scale," Alexander points out. "As the use grows, the company can do a make-versus-buy analysis and decide when to bring inside."

Adds Alexander, who was once MCI Mail's MIS manager, "This is the course that a number of other services have gone, such as timesharing. It's a natural for e-mail."

Western Digital's Carlson observes, "While intracompany communication is our first priority, we've also recognized the importance of being able to communicate electronically with people outside [the company]. With a software package called VAX Mailgate for MCI Mail, codeveloped by DEC and MCI, we will be able to communicate with our customers, business partners, and vendors via MCI's public network without compromising the security of our own system."

Apart from the logistics of in-house versus external e-mail systems, the use of this service can provide important benefits for organizations. One of the claims that is most often advanced is increased productivity.

"E-mail has tremendous potential for improving end-user productivity," says Carlson. She offers an example: "One of our immediate goals is to develop an application to issue quarterly earnings releases electronically. Today, our mailing list exceeds 500 recipients. Rather than generating 500 signature-stamped letters, a single letter can be produced and delivered to any postal address in the world by using company letterhead with signature. This is just one of many potential applications."

☐ **BOEING'S CUSTOMERS REQUIRE IT TO MAINTAIN CONTINUOUS E-MAIL COMMUNICATIONS.**

Boeing Aerospace's customers, including the U.S. Defense Department, make it a condition of their contracts that the company maintain continuous e-mail communication links with them, says e-mail project leader Darrell S. Corbin. Consequently, his company's end users are generally well aware that their e-mail systems are important and powerful resources. Boeing Aerospace provides various programs and services for employee e-mail training. Corbin's work team, charged with interconnecting disparate e-mail systems as necessary, works very closely with Boeing Aerospace's corporate MIS department.

"E-mail systems start with the users and their applications," says MCI Mail's Brackbill. "It's useful to begin by identifying internal departments/users with a strong need to communicate both internally and externally."

Brackbill advises IS managers to "understand their traditional modes of communication and the improvements desired—speed, convenience, productivity, competitive advantage, etc.—as well as their level of computer automation."

Brad Schultz is a freelance writer based in New York.

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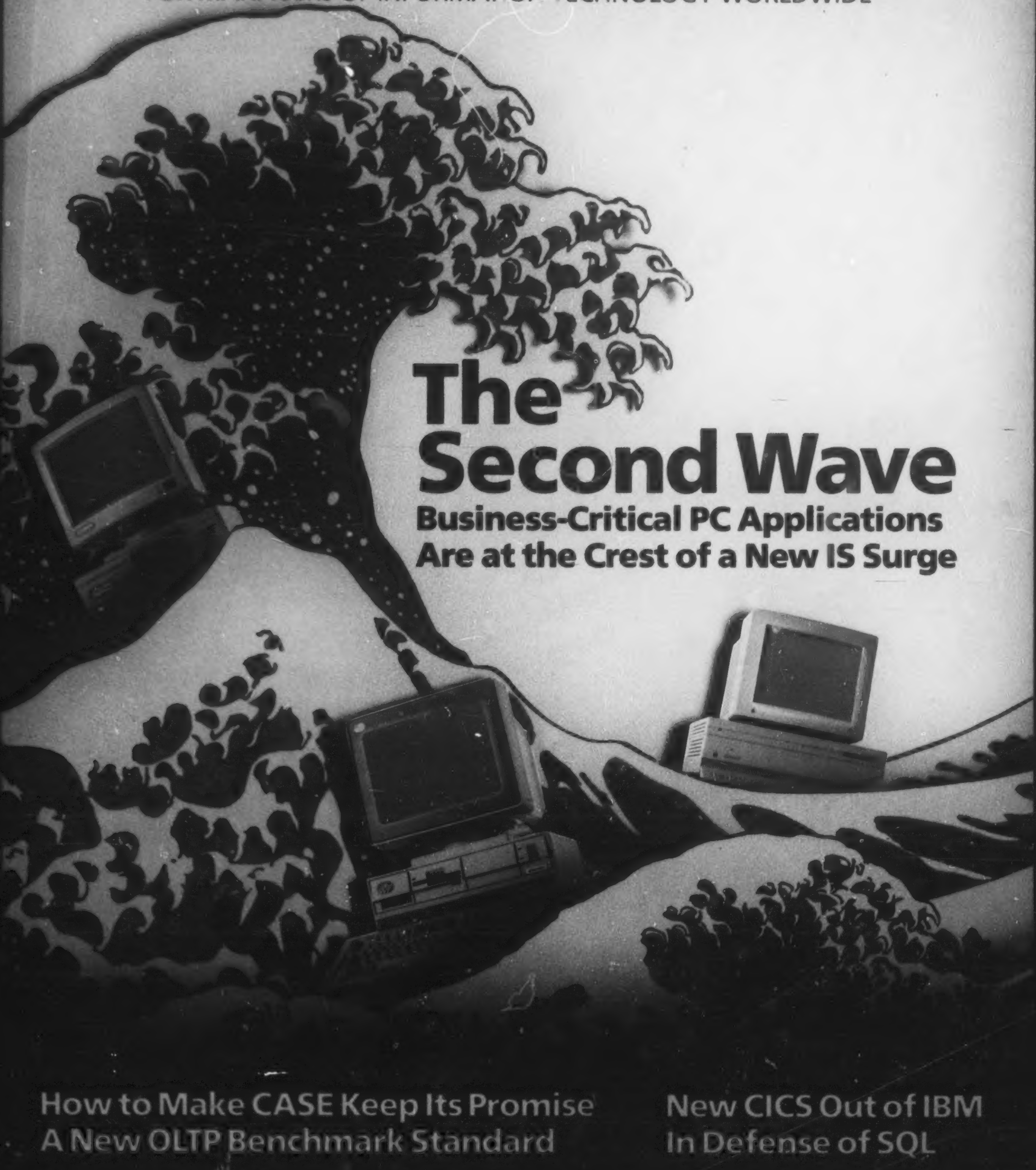

The Second Wave

Business-Critical PC Applications Are at the Crest of a New IS Surge

How to Make CASE Keep Its Promise
A New OLTP Benchmark Standard

New CICS Out of IBM
In Defense of SQL

FEB 1, 1989
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NUMBER 3

DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

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BY JEFF MOAD Companies can be washed away by the knowledge that many of their most irreplaceable applications are PC-based and end-user controlled. Failure of these applications could threaten a company's very existence. As these company-critical applications replace task automation as the biggest trend in PC use, most companies are looking for a better way to manage development and support of those systems. Companies are often slowing their PC buys in the process.

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Cover Photography by Walter Wick

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BY SUSAN KERR A raft of new versions of IBM's Customer Information Control System have been shipped and are still due for MVS/ESA, VM, and even OS/2. As CICS marks its 20th anniversary, users expect the new, improved CICS to overcome existing storage and cpu constraints.

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INSIDE DATAMATION

The Issues of the Day

When DATAMATION started its Issues series last year, our intent was to focus on the most important management, systems, and organizational IS issues facing users. We are continuing with this series, and the first installment of the year, "The Second Wave," on p. 14, deals with the role of personal computers in IS.

San Francisco Bureau Manager Jeff Moad, the author of the article, puts the issue into perspective: "As divisions, departments, and business units continue to increase PC spending and to build more company-critical applications around PCs, most companies are looking for a new and better way to manage the development and support of those systems. They are putting an end to the often ad hoc, disjointed approach to PCs that evolved in the early to mid-1980s. This second-wave approach to PC-based systems has companies insisting . . . that they conform to standard development methodologies and consciously link these new applications directly to specific business objectives, not just to some vague notion of personal productivity."

Photograph by Jeff Reinking

DATAMATION'S JEFF MOAD, San Francisco Bureau Manager, has been covering the industry for the last 10 years.

This story has much relevance to you, the IS manager, because it brings into focus the key systems/management/organizational relationships in the use of PCs. It is no easy challenge to provide this kind of analytical synthesis, but Moad, who has been covering the use of information systems for more than 10 years, was a natural to take on the job. Of course, this meant he had to put aside a couple of his favorite pastimes—traveling to baseball training camps to watch the players work out, playing the odds at his favorite craps table (he is a former Lake Tahoe croupier), and watching old Clint Eastwood *Dirty Harry* movies—but he promises to return to them with a vengeance now that the story is done. The leisure world's temporary loss, we trust, will be your gain.

Also in this issue is the first of a two-part rebuttal to a two-part article we published last summer called "Fatal Flaws in SQL," by E.F. Codd, the father of the relational model. Written by David Beech while he was at Hewlett-Packard Laboratories in Palo Alto, the article (on p. 29) comes to the defense of SQL and tries to poke holes in some of Dr. Codd's arguments. In our next issue, Beech will offer some suggestions to extend and improve what has become a standard in languages.

Other articles of note in this issue include one by consultant Omri Serlin on a new standard for OLTP benchmarking (p. 47) and one by our intrepid San Jose Bureau Manager Susan Kerr, called "New CICS Out of IBM" (p. 59). Serlin, the founder of a vendor council on transaction processing performance, details what the council is doing to evolve the original DebitCredit benchmark, specifications for which were first published by DATAMATION in 1985. Kerr gets inside IBM's recent statements of direction for CICS, including a new code base that will operate in MVS/ESA environments, and puts into perspective what the new CICS will mean for users.

—David R. Brousell, Executive Editor

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The Second Wave

PC use is still rising, albeit more slowly, as companies realize the importance of today's end-user systems and decide how best to manage and protect them.

BY JEFF MOAD

Top executives at Palo Alto-based drug manufacturer Syntex Corp. recently made a surprising—some would say alarming—discovery after taking a hard look at the use of PCs in the company's business units.

More than 25% of Syntex's employees already had PCs on their desks, and the number was growing as the company's PC-related spending ate up an increasingly large share of its IS budget. But that wasn't the surprise. Like Syntex, most large companies today are spending more and more on PC hardware and software and associated technologies in support of end-user-based applications. A recent study by management consultants Nolan, Norton & Co., Lexington, Mass., estimates that on the average, corporations will soon be spending 40% of their IS budgets on end-user technologies.

The surprise for Syntex was the realization that an increasing number of applications, written by its autonomous business units and running on its mix of Macs and IBM and Digital Equipment Corp. PCs, were becoming so central to its business that their failure could have a quick and direct impact on the company's bottom line. We're not talking spreadsheets and word processing here. We're talking about custom PC-based systems that were doing everything from monitoring and controlling lab procedures to compiling and communicating vital drug testing information to government agencies such as the Food and Drug Administration.

The alarming part came when Syntex officials discovered that some of those PC-based, critical applications were being built and implemented without much concern for the type of basic controls that most central IS types take for granted. No standard development methodology or validation procedure. No documentation. No backup, recovery, or security.

Syntex decided to do something. "We started with the idea that [business unit managers] must have the responsibility to be sure that the company is getting the type of payoff it expects from these systems, and that they are doing what they are supposed to be doing," explains Helen E. Peters, director of office information services for the company. "We have said, 'If you choose to have this system developed by your own people, you, Mr. Businessman, are going to be accountable for certain things.' "

Before they were finished, Syntex's IS planners had made some dramatic changes in the way the company manages end-user-based applications. A task force manages end-user-based applications. A task force consisting of business unit managers, PC managers, and central IS put together a set of guidelines that defines company-critical applications and mandates controls for which business unit managers are responsible. And Syntex went further, abolishing its outmoded information center in favor of putting more development expertise directly into business unit IS organizations and encouraging them to involve end users, representatives from other divisions, and central IS in a team approach to developing and implementing PC and other end-user-based systems (see "Syntex's System Commandments").

"We've had to take a more organized approach to end-user computing now that we're moving from counting beans with it to actually running the business on it," says Peters.

Syntex isn't the only large company trying to exert more coordination and control over PC-based applications. As divisions, departments, and business units continue to increase PC spending and to build more company-critical applications around PCs, most companies are looking for a new and better way to manage the development and support of those systems. They are putting an end to the often ad hoc, disjointed approach to PCs that evolved in the early to mid-1980s.

This second-wave approach to PC-based systems has companies insisting not just that business units adhere to technical standards, but that they also conform to standard development methodologies and consciously link these new applications directly to specific business objectives—not just to some vague notion of personal productivity.

"We're now over the initial phase of end users saying, 'I need to have a PC to be somebody,' " says Jim Miller, vp of MIS at of Richmond-based James River Corp. of Virginia, another company that is reevaluating how it manages PCs. "Now many end users are at the point of saying, 'We didn't get it quite right the first time around.' We're all realizing we've got to get a lot smarter about how we manage PCs," remarks Miller.

The questions Miller and many others are asking are already profoundly changing the roles, responsibilities, and challenges for every player in the PC game:

- Central IS, which in the past has played a spectator's role in PC-based, end-user computing, is now beginning to assert itself by setting standards and, in many cases, actually controlling development, implementation, and support of company-critical, PC-based applications. The challenge for IS is to take a more active role without stifling what has become the valuable hallmark of the PC revolution—providing locally controlled, quick solutions.
- Business unit technical support groups are taking a much more active role in planning and developing end-user-based applications with an eye toward companywide business objectives. Many companies are shutting down centralized information centers and making a conscious effort to seed business unit IS teams with seasoned professionals who are familiar with a wide range of platforms and technologies, not just PCs.
- End users are being asked to take more responsibility for seeing to it that the applications they are demanding conform to companywide architectural and business goals. And they are becoming active partners in team approaches to PC-based application development. Already, according to market researcher Input of Palo Alto, 50% of the companies it interviewed report that end users are developing production systems. And half of those companies said end users would be responsible for more than 25% of all their new applications in 1988.

JAMES RIVER'S MILLER: Many users are saying, "We didn't get PC management quite right the first time."

Photograph by Art Stein

- PC vendors often are looking at longer selling cycles and an increased demand for service and support as many companies that are focusing on company-critical PC applications look to offload responsibility for well-established task automation applications such as spreadsheets and word processing. In some cases, vendors are seeing large companies temporarily slow their acquisition of new PC hardware and software as they search for new management approaches to company-critical PC-based applications.

Not coincidentally, many market watchers have begun to project a slowdown in what has in recent years been an ever more rapidly expanding PC market (see "The Coming PC Slowdown"). A recent survey of large corporations by DATAMATION and Cowen & Co. actually identified a decline in PC units shipped in 1988 compared to 1987. It was the first time the annual survey showed a drop.

PACBELL'S MILLER AND ZELLARS have related the cost-cutting results of their PC management study to other units, but aren't dictating policy changes.

Photograph by Jeff Reinking

While most analysts are slightly more optimistic, most are predicting a moderating growth trend in 1988 and 1989. Many observers are attributing the flattening demand trend to user confusion over new and competing PC technologies and to PC prices that are being kept high by component availability and other factors. As memory shortages begin to ease, and lower-priced 80386SX-based systems become available later this year, followed by 80486-based systems sporting two-times-386 performance, many analysts are predicting a return to 20 +% PC demand growth in 1990 (see "Probing the Roots of PC Purchasing").

Others, however, say there's more to the PC demand pause than technology alone. The drive by many large companies to find a new model for managing end-user-based systems, they say, also is having an effect on PC demand. According to Art Benjamin, consultant and president of Toronto-based On-Line People, "The first pause in the PC market came around 1984 when people started asking whether PCs were actually helping productivity or just turning executives into typists. Now we've been seeing another one, as people question not only whether they need OS/2 or DOS but as they try to understand how to approach PC-based systems as they become more strategic."

Centralizing End-User Computing

One large company going through that process right now is California RBOC PacBell. The San Ramon-based utility recently completed a pilot study aimed at understanding how its operating units manage its menagerie of PCs and end-user systems and how the company can better coordinate planning, development, and support. The study eventually led one large PacBell operating unit in Alameda and Contra Costa counties to form a centralized end-user computing center with responsibility for applications development and support.

The end-user computing center immediately took control of the operating unit's data networking and office automation planning efforts and put on hold requests from several work groups for PC- and local area network-based OA systems. After a four-month study during which the center interviewed 20% of the operating unit's end users, it decided against going with PC-LAN solutions altogether, opting instead for a terminal-to-Unix system running on a new data-over-voice network linking the entire 2,500-person unit. The network is a PacBell-designed 9.6Kbps implementation called PBLan. The OA application will use commercial software running under Unix V version 3 on dumb terminals and a minicomputer from Arix Corp., San Jose.

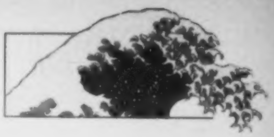
According to Kris Zellars, computing manager for the PacBell pilot project, going with a terminal-to-Unix approach instead of a PC-LAN solution will not only improve the business unit's control over end-user-based applications, but will also cut costs. Most users in the Alameda/Contra Costa business unit still use dumb terminals, and the new system will allow them to plug into new OA applications over existing phone lines.

"A lot of people thought they really needed PCs and LANs, and they weren't that thrilled with the solution we came up with," says Zellars. "But PCs and LANs get awfully expensive, and this way we can do everything a PC-LAN approach can do and stay within our overall architectural plan." Plans call for the new end-user computing center to control other critical projects.

The PacBell study was prompted in large part by growing upper management concern with the cost of PCs and end-user-based systems. PacBell now has about 25,000 PCs installed. According to manager of portfolio management Brian Miller, the company was worried not only about the cost of the hardware and software but also about support costs. Nolan, Norton has estimated it costs corporations about $18,000 per PC per year on average, with the largest chunk, 39%, eaten up by support costs.

PacBell management became convinced the company was paying plenty in under-the-table support costs as end users sought help from de facto local PC gurus who were being distracted from their real jobs. "There were lots of hidden support costs that there was no way to quantify," says Miller.

The second-wave approach is linking PC-based systems to specific business objectives.



Now PacBell hopes that other operating units, after studying the results of the Alameda/Contra Costa pilot project, will begin to make similar changes in their approach to PC and end-user systems. But PacBell isn't mandating the approach. For one thing, not all of its operating units are large enough to require such a formalized coordinating function. And, for another thing, PacBell, like most companies, is hesitant to begin taking a top-down, authoritarian approach to end-user computing.

"We've communicated the results of the study and said here are the key findings, but we're not dictating what they should do," says Miller. "If we were to do that we would still be treating it [end-user IS] as a unique venture. What we really want is for it to become integrated into the business."

It's not unusual for end users and local support groups who are used to lots of freedom in developing PC-based systems to rebel against more coordination and control coming from IS or high-powered PC swat teams. "Many end users have gained much more technical sophistication and they're saying 'we just don't need you anymore,' " says Sarah Kaull, associate director of the Partnership for Research in Information Systems Management, a research service of the Index Group and Hammer & Co., both of Cambridge, Mass.

End-user groups often are reluctant to give up control over their own IS destinies. And they don't like the idea of a project schedule stretching out as IS and others get involved in development, which can happen. At Merrill Lynch, for example, a massive trader automation project, running on 19,000 386-equipped IBM PS/2s, was taken over by IS, and it is just now going into its initial prototype phase, a year and a half after the project was initiated.

Syntex's System Commandments

Syntex Inc. recently put into practice a new set of policies intended to impose a standard set of management controls on company-critical, PC-based applications being developed and supported by the company's business units. The guidelines, developed by Syntex's central IS, its business unit IS groups, and central service organizations, attempt to define company-critical applications and the controls that must be applied to them. They also spell out who in the organization is responsible for what aspects of justifying, developing, and supporting these critical, end-user-based systems.

Company-Critical Systems

Syntex defines company-critical end-user-based systems as having any of the following traits:

- The system or its data is critical to the operation of the corporation or division. Failure or loss of data "would result in serious work disruption or significant financial impact."
- The application is time-critical.
- The system produces checks, purchase orders, warrants, or other negotiable documents.
- The system contains sensitive information such as trade secrets, personnel data, or formulas.
- The system must comply with regulations such as generally accepted accounting practices or good laboratory practices.
- The system contains data that is subject to examination by regulatory agencies such as the Food and Drug Administration.
- The system contains data with a requirement for long-term archival storage, such as the results of clinical studies.
- The system feeds data to other systems that have the above traits.

Controls

End-user-based systems qualifying as company-critical must be developed and supported with certain specific controls. They are:

- A consistent systems development approach that includes provisions for testing to determine whether the system is doing what it was designed to do. The system also must be consistent with other databases in the company.
- A system notifying users when any changes in the system are planned and for testing the effect of those changes on live databases. Also, a system for testing the cost/benefit of running new versions with existing versions for any given time.
- A system for validating compliance with formal procedures such as good laboratory practices.
- Formal documentation so that a system can survive the departure of its creator.
- Means for securing the physical system, data storage media, sign-on, file systems, and printed information.
- Formal backup and recovery procedures.
- Training at least two people in the operation and maintenance of any critical system.
- A formal system for justifying and coordinating hardware and software acquisitions that includes a definition of the scope and purpose of the system, its business benefits, and a cost-benefit evaluation.

Responsibilities

Syntex's document describes the responsibilities various organizational entities have in ensuring that company-critical systems are developed with the required controls:

- Division general managers are responsible for ensuring compliance with the guidelines and for providing resources to support the company-critical information systems.
- Line managers in business units are responsible for identifying company-critical end-user-based applications. "Line managers are accountable for the decision as to whether applications will be developed and maintained by their own department staffs or by an outside information systems department. Regardless of how the system is developed, responsibility for compliance . . . rests with line management," the guidelines state.
- User-developers must implement the controls outlined in the guidelines at the direction of line managers.
- End users are accountable for the decisions they make using system-generated information.
- IS is responsible for developing procedures to implement the guidelines, including educating line managers "on the risks of developing systems without appropriate controls," the document states.

"Taking the time and effort to build systems in a prudent manner may increase the perceived cost of system development and operation. It is important, however, for managers to realize that ignoring risks is not an acceptable alternative, since the hidden costs of system failure or malfunction must be considered," the guidelines say.

"Taking a more comprehensive approach to end-user computing does take more time, and we've had to explain that to a lot of users who sometimes have false expectations," says PacBell's Zellars. "Sometimes they do get impatient with the process, though."

Many of those pushing for a second-wave approach to PC management say the last thing they want is to put roadblocks up in front of end-user IS development. "But it's a fine line," says E. Sheldon Gregory, information services customer support manager for San Francisco-based Bechtel Power Corp., which is also trying to take a more coordinated approach to managing its 2,720 Macs and IBM PCs. "We don't want to try to control [end-user computing] too much, because then we'll lose it. But we do need to end some of the inefficiencies. We don't need people in each operating company evaluating Lotus, dBase, and Oracle. And we don't need to be using lots of different user interfaces," according to Gregory.

> We don't want to try to control end-user computing too much, because we'll lose it. But we do need to end the inefficiencies.
>
> E. SHELDON GREGORY
> BECHTEL POWER

Benefits of a Coordinated Approach

Bechtel has formed a couple of task forces to develop companywide end-user technology standards and to identify and focus resources on company-critical PC applications. The latter effort, called the Partnering Task Force, is composed of representatives from IS, each of Bechtel's operating companies, and companywide service sectors such as finance. The group is developing critical PC-based applications in part to demonstrate to Bechtel's business units what can be accomplished with a coordinated approach to end-user systems. "MIS has a lot to bring to this arena, but we need to show value added. We need to have some winners," says Gregory. "We're in a 'show me' environment."

So far, the Bechtel partnering group has developed two executive information systems. One custom EIS—for Bechtel's executive committee—based on the Command Center software package from Pilot Executive Software, was rolled out in nine months.

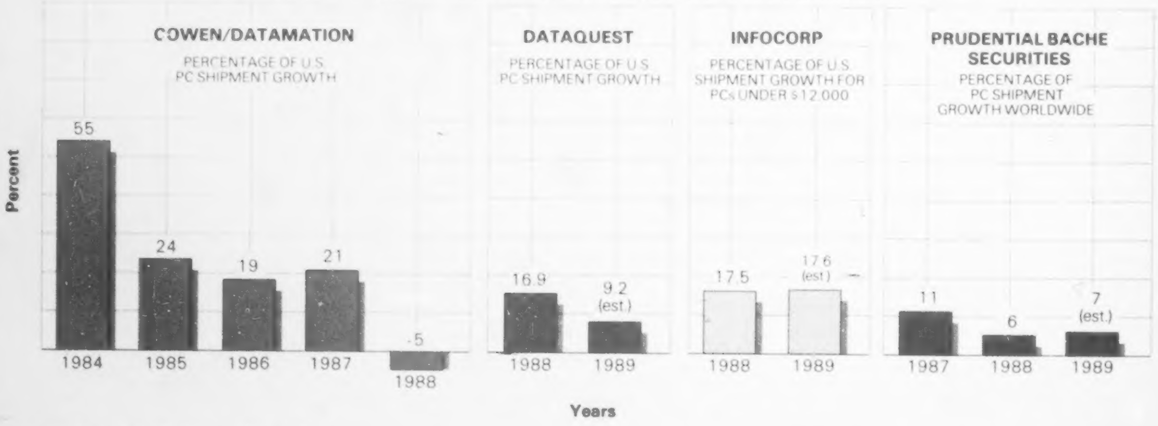
Gregory says that soon Bechtel will turn the partnering task force into a permanent organization under IS to manage corporate planning and reporting of end-user-based systems. In addition to EIS, the group will also focus its attention on videotex and text management applications.

According to some IS executives pushing for a more coordinated approach to end-user computing, one key is to recognize that end users have gained plenty of expertise and experience since the PC revolution started in 1981. "We have to realize that we [MIS] are not the only experts now," says Syntex's Peters. "The end users bring plenty of knowledge, and we have to recognize that. In fact, we're finding the early PC adapters are learning some of the same lessons that we in MIS learned years ago, like the need for backup and audit trails."

While some corporations are attempting to set examples and gently convince business units to cooperate with common, enterprisewide approaches to end-user computing, others are taking a more aggressive approach. Paper and packaging manufacturer James River Corp., for one, is experimenting with greater IS influence over critical PC-based applications development. For example, the company's MIS department is in the first phase of developing a PC-

The Ebbing First Wave

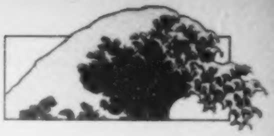
Most market researchers predict that companies will slow their acquisition of new PC products as they search for new management approaches to company-critical PC-based applications.



Source: Cowen & Co., InfoCorp, Dataquest, and Prudential Bache

Chart by Paragraphics

Some firms are more aggressive in controlling and coordinating their end-user systems.



based production scheduling system that will tie together eight paper mills and sales and customer service departments. Miller acknowledges the changes he's making will, in many cases, cause PC-based developments to take longer getting off the ground, but he says it's worth it.

"Historically, our PC-based applications have been largely user-driven, with users providing the expertise themselves," says Miller. "But, in recent years, there's been a ground swell of discontent from users. There's a feeling that there's been a proliferation of PCs but not a proliferation of good solutions." That is true particularly as end users get more ambitious with their PC-based applications. "Many are reaching critical mass and turning to the MIS group for help," says Miller.

If getting IS more involved and enforcing a more disciplined approach to PC-based applications development means projects take longer to get implemented, that may not be all bad, says Miller. "The premise has been that if you're going slow, you're doing something wrong. I'd want to test that idea. I'm not sure it's right," says Miller. "Formalizing the process may end up helping users more than slowing things down."

That's not to say that Miller is pushing for IS to become an authoritarian force over all end-user-based projects. In fact, rather than disbanding its information centers as some companies are doing, Miller is pushing to upgrade technical expertise at the company's three information centers so they can take on development projects involving a wide range of technologies, not just PCs. James River is adding de-

Probing the Roots of PC Purchasing

Recent user surveys and analyst projections have begun to show that while businesses still plan to buy more PCs this year than last, the rate of growth is slowing, particularly compared with dynamic growth spurts seen in 1984 and 1985 (see "The Coming PC Slowdown"). But the experts don't agree on how much growth is slowing or why.

Market analysts such as Dataquest Inc. and InfoCorp project growth in the number of microcomputers sold to slow to between 9.2% and 12.5% in 1989 from a 16.9% jump in 1988. Securities analysts such as Prudential-Bache expect units shipped in 1989 to grow 7%. These figures contrast sharply with the 35% growth rate in 1984 and 127% in 1983. Even the growth projections of PC market bulls such as Compaq Computer Corp. are lower than in the recent past. The 1989 growth of 15% to 20% that Compaq predicts for its high-end products would be down from the larger-than-expected 30% growth Compaq saw last year, according to marketing vp Mike Swavely. Of course, as the number of PCs shipped in any given year becomes larger—about 16 million in 1987—it becomes more difficult for the PC industry to sustain a steep growth rate. But analysts see other reasons for the apparent moderating trend.

Analysts who have a PC product orientation assert that the recent proliferation of important new PC technologies such as 386SX, OS/2, Micro-Channel Architecture, and Extended Industry Standard Architecture (EISA) has users confused and waiting for the smoke to clear. "Users have been somewhat awed by all the new technology, but we believe the availability of significant numbers of 386SX machines will fuel growth of the 32-bit market in 1989," says InfoCorp PC analyst Stella Kelly.

Others see the PC market as a winded runner ready for a breather. The market has been growing so fast for so long, "it seems like people are predicting one just because they think there should be one," says Dataquest industry analyst Robert Charlton. Others think users are waiting for vendors to offer better PC deals before picking up the purchasing pace. "From September to September we've seen virtually no price/performance improvement at all, largely because of the DRAM shortages," says Prudential Bache analyst Kimball Brown. As a result, buying hit a wall mid-year.

But, says Brown, demand is still there, and the market will come back with a vengeance in mid-1989 when systems based on Intel's lower-cost 386SX microprocessor begin to ship. At that point, 386-based systems now costing $4,500 will drop to about $3,000, says Brown. Demand will rebound further in 1990—back to 25% annual growth—when systems based on Intel's 486 microprocessor double the price/performance of 386-based systems and when new, blockbuster applications for OS/2 emerges.

At the same time, others note the slowing effects that user efforts to control and coordinate their management of end-user-based, company-critical systems can have on PC-based development. "The kind of issues companies are facing now are much more difficult, more time-consuming," says Paul Saffo, an analyst with the Menlo Park, Calif.-based Institute for the Future. "The easy stuff like word processing has all been done. We're at the point where organizational issues become the obstacles."

While many users report that facing those issues is leading them to slow end-user- and PC-based development, in the long run, large company-critical PC-based systems will account for plenty of the PC market's growth. "When we do buy PCs for these company-critical projects, it's in large numbers," says Syntex Inc. director of office information services Helen E. Peters.

SYNTEX'S PETERS: Buys large quantities of PCs for implementing company-critical projects.

Photograph by Rick Browne

velopment experts who have experience with environments such as VM, 3270 data transfer, and COBOL, as well as its 386-based PCs, at its three information centers in Richmond, Norwalk, Conn., and Oakland, Calif.

"We want to get users away from the idea that all they need to know about are PCs," says Miller. One of the problems, he says, is that users often tend to reach for the same solutions, regardless of the problem. "If all you've got is a hammer, everything looks like a nail," he says.

Trading Autonomy for Coordination

While some end users may have misgivings about trading autonomy for more coordination and control, many seem to see the value of a new approach to PC-based systems. One such user is John Taylor, manager of sales systems in Syntex's sales organization. He says the biggest impact on him has not been Syntex's focus on development disciplines such as security for end-user systems. The biggest change, he says, has been in the push toward a team approach to new PC-based projects. "It's definitely becoming more common as it becomes more successful," says Taylor.

We want to get users away from the idea that all they need to know about are PCs. . . . If all you've got is a hammer, everything looks like a nail.

JIM MILLER
JAMES RIVER CORP.

Taylor recently was involved in developing a critical, PC-based inventory control system designed to satisfy FDA regulations on drug companies' distribution of free samples to physicians. The planning and development was done by a team from central IS, sales tech support, technical people from other business units, and end users. The consensus approach created some disagreements between the various factions and added about 12% to the overall development time. "But," Taylor says, "we now have a more comprehensive design that is more flexible to changing business needs. People need to realize that the greater good is to end up with a better system."

The focus on new approaches to critical PC-based projects is also changing the ground rules for vendors in the PC market, particularly those selling software solutions. They face longer selling cycles. And sometimes it's not obvious who in an organization they should be selling to as their customers take more coordinated, team approaches to PC-based applications.

According to James A. Perakis, president and CEO of PC-based financial reporting software maker IMRS Inc. of Stamford, Conn., "Just a couple of years ago, the primary motivation for our customers was to break from MIS. They wanted to do their own systems in their own way." But that's all changing fast. "Now when we go into a sales situation, very often MIS is right in there as part of the evaluation team, along with the end-user organzation—usually finance—and a consultant. Usually we spend some time trying to figure out who's taking the lead role. The surprising thing is that today, as often as not, it's a young MIS guy, under 30, throwing his weight around at these meetings," says Perakis.

As corporations turn their attention more to company-critical, PC-based applications, vendors also are being asked to take on more of a service and support role, particularly when it comes to more generic applications such as word processing. One large company, Rochester-based Eastman Kodak Co., is said to have recently asked vendors to bid on a project to manage most of its generic, standalone PC applications. Businessland, Centel, and IBM are said to be among the bidders.

One vendor focusing on that kind of business is Corporate Software of Boston. Besides selling software packages for PCs, Corporate Software will, for an additional charge, coordinate a user's PC hardware and software portfolio and support activities. "Lots of companies would rather just write a check for that and focus their attention on more strategic, custom applications," says Corporate Software marketing vice president Vince Kelly. Not all PC vendors see the new-wave, coordinated approach to company-critical applications significantly changing their market or slowing growth. Mike Swavely, marketing vp for leading IBM PC-compatible vendor Compaq Computer Corp., says most of Compaq's hardware business will continue to come from task automation-type applications, not company-critical, business automation projects. And the responsibility and control of projects will continue to come from the departments and business units, Swavely says. To the extent Compaq is preparing for a new approach to company-critical applications, it is through new products such as the Extended Industry Standard Architecture bus the company is promoting as an alternative to IBM's Micro-Channel Architecture.

Other observers, however, have very little doubt that large companies are changing their approaches to end-user computing rapidly and that it means more coordination and control, not less. Analysts such as Nolan, Norton, in fact, see the new wave of PC development approaches as only part of a long-term trend that will, in the 1990s, see companies using end-user computing to alter their basic business organizations fundamentally and receiving 10-fold returns on their PC investments, not just the 10% to 20% most see today. Companies such as James River are planning for that today. According to Miller, the company has begun studying what kind of basic organizational efficiencies it could expect if end-user-based systems could provide workers more complete, practical information. "We could get by with two levels of employees. One guy to run the mills and one guy to run the machines," says Miller.

Right now, however, IS planners at most large companies seem to have their hands full just catching up with their own business units. "We've already taken that leap of faith and bought lots of PCs," says Bechtel's Gregory. "Now we're just trying to figure out what's going on out there with all of them." ▭

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FEBRUARY 15, 1989

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OS Tug of War!

Unix and OS/2 Are Battling for Your Company's Desktops

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Is Error-Free Software Possible?
Aiming IS at Business Targets
The Modem Protocol Duel

FEB 15, 1989

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NUMBER 4

DATAMATION®

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

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Desktop Tug of War: OS/2 vs. Unix 18

BY BOB FRANCIS In its simplest form, the desktop decision facing IS managers boils down to two obvious choices—Unix or OS/2. Far more complicated are the issues that must be considered to make that deceptively simple decision. The prime determinant is the overall character of the application, which dictates other central issues such as power, complexity, and communications capabilities.

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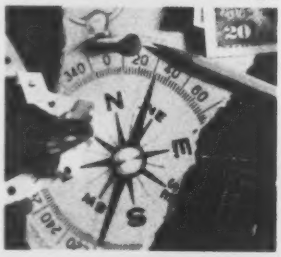

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Living and Thriving at Technology's Edge

The leading edge of information technology is a destination that's neither easy to reach nor comfortable to occupy for very long. The travel costs can be extraordinarily expensive. And the rules of living there seem to change with every new advance in research, trend in business, or shift in policy. The rewards, however, are enormous, judging from the number of organizations that have embarked on journeys in search of technology that would give them sustainable leads over competitors—the edge, so to speak, over the other guy.

Many users, in fact, have already started down the road toward using desktop technology to its fullest advantage. Dallas Bureau Manager Bob Francis has been along for much of the ride in the past two years. One of the big forks facing those corporate travelers, he finds today, is the choice of advanced operating systems for the millions of PCs and workstations atop the desks and benches of their end users.

Photograph by Ben Weaver

PC RANGER FRANCIS sees organizational traits driving OS decisions.

In "Desktop Tug of War: OS/2 Versus Unix," p. 18, Francis measures the criteria by which users are evaluating the two OSs, including the the different memory requirements and interface qualities of Unix and OS/2. And he goes one step further, discovering through countless user interviews that it's the character of the organizations themselves that often dicates which path they follow. "When we decided to standardize on the Unix operating system," one IS exec tells Francis, "we had to examine not just what would save us the most money, but what kind of work each department did and what kind of work they might be doing in the future. So it wasn't an easy task."

The future in PC technology use is here today at a Pepsico Inc. division, Francis tells us in his companion article, "Frito Lays a New IS Bet," p. 75. Upon visiting chip maker Frito Lay Inc. in San Antonio, he realized that the Pepsi subsidiary was moving swiftly beyond its much heralded use of handheld computers into the realm of decision-support and executive-information systems built on an OS/2 chassis.

Unix itself is edging onto platforms besides workstations. San Francisco Bureau Manager Jeff Moad, who tracks large-scale systems developments for DATAMATION, reports that technological innovations such as new high-performance multiprocessor architectures and transaction-intensive RDBMSs for Unix systems are luring major users like the Internal Revenue Service to implement the OS on minicomputer and mainframe platforms. IS execs who believe such a move could give them an advantage should read "Unix Goes Upscale," p. 61.

Operating on the edge, of course, has its perils. One danger is that security is forgotten in the headlong rush to embrace the latest and greatest technology. Another is that the real computing needs of the organization are ignored in the pursuit. In "The Virus Cure, p. 29, John McAfee reminds us just how vulnerable distributed computing solutions have made many large corporations. Even more important, he offers some remedies for the security ills that can befall users in such environments. In "Aiming IS at Business Targets, p. 93, Thomas Lodahl and Kay Lewis Redditt argue convincingly that IS execs need to formally align their organization's business goals with their IS capabilities. If they don't, they risk going over the edge.

Tim Mead

—*Tim Mead, Editor-in-Chief*

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THE VIRUS CURE

What was once considered science fiction is now reality as computer viruses creep into computer sites. Here's some advice on how to recognize and prevent viruses, and how to recover from infections.

BY JOHN McAFEE

In the summer of 1977, Thomas J. Ryan wrote and published a book that became an instant cult classic for computer hackers and technophiles. *The Adolescence of P-1* chronicled the fictional development of the world's first virus—a program that moved from computer to computer, taking control of the operating systems of 7,000 computers.

When this book first appeared, it was regarded as good science fiction. A mere 11 years later, a Cornell graduate student turned the experience into reality when he developed a program that ran amok: it jumped into the world's largest computer network and began taking control of the connected machines. The program was designed to both hide itself (fortunately the design had a bug) and defend itself against removal. It could also adapt to at least two radically different computer architectures. It spread like wildfire. The number of systems infected? 6,200.

Although Ryan did not apply the name "virus" to the subject of his book (Xerox developers in Rochester, N.Y., had been doing virus research for five years, but this use of the word was largely unknown to the general public), he anticipated the current state of affairs with accuracy.

Viruses have become a cold, harsh reality for a growing number of businesses, government agencies, and universities. The first seven months of 1988 produced over 300 major virus attacks, involving over 50,600 computers. Most were of unknown origin. Many involved substantial time and resources for removal, clean up, and restoration. Each was a surprise to the infected organizations.

The sudden appearance of the virus threat has caused vast amounts of misinformation and confusion to be generated. Standard terminology is in short supply. Prevention measures are incomplete and often conflicting. Recovery procedures are mostly seat-of-the-pants affairs. People are confused about what viruses are and how they spread, and snake-oil salesmen abound.

The confusion is not improved by conflicting opinions about the future of viruses. Some contend that it's a passing fancy that will take care of itself. Others feel we have seen only the tip of the iceberg.

Much of the confusion stems from limited and incomplete information. Many people have never seen a virus in action and are speculating about the effects and potential damage. Others have seen perhaps one or two examples of viruses, and extrapolate to the larger world of viruses from these small experiences. Even companies that fall prey to widespread in-

Illustration by Tim Grajek

fection, experiencing firsthand the devastating effects of viruses, often are unwilling to share their experiences with the public, or to provide guidance and counsel to other companies hit with similar infections. Less than 10% of the 300-plus organizations attacked by viruses this year were willing to publicly discuss their infections.

There is a general, and possibly warranted, feeling that a publicized virus infection will carry a social or commercial stigma that will harm a firm's image and marketing goals. Questions of lax security, disgruntled employees, damage to the organization, and impact on the company's products inevitably arise. The more a company's products use software as integrated components, the more this feeling prevails. Earlier this year, one large aerospace manufacturer threatened to sue a virus consultant who inadvertently slipped news of an infection to the press.

In spite of this cloak-and-dagger environment, researchers have been able to identify over 30 different strains of viruses with widely diverse propagation mechanisms and destructive effects (see "The Six Most Common Computer Viruses"). Each of the strains has multiple varieties—a result of hackers' laziness: it is easier to modify someone else's virus than to build one's own from scratch. One Macintosh virus—nVIR—has over two dozen different varieties. As a result, hundreds of essentially different viruses are threading their way from system to system around the world.

☐ RESEARCHERS HAVE BEEN ABLE TO IDENTIFY OVER 30 DIFFERENT AND WIDELY DIVERSE STRAINS OF COMPUTER VIRUSES.

What Are Computer Viruses?

Computer viruses are segments of self-replicating code that attach themselves to application programs or other executable system components. They attach themselves in a manner that allows them to gain control during some phase of the host's execution. Viruses can attach not only to boot sectors, operating system modules, and device drivers, but any application, such as a word processor, spreadsheet, or database system, is vulnerable.

Most viruses leave no external signs of their presence after infection. They infect the host in a manner that leaves the host functions unchanged. An infected pro-

The Six Most Common Computer Viruses

These are the culprits most often cited at infected computer sites.

Based on a study conducted by the Computer Virus Industry Association of its members, March 20, 1988, to Sept. 9, 1988.*

	Pakistani Brain	**Scores**
ORIGIN	Lahore, Pakistan, Jan. 1986. Developed by two brothers as as an experiment.	Electronic Data Systems, fall 1987.
HOST	IBM PCs and compatibles	Macintosh
CLASS	Boot sector infector	Generic application infector
DESCRIPTION	Replaces original boot sector. Moves original boot sector to another location. Adds seven sectors that contain remainder of virus. Flags all modified sectors as unusable to protect itself. Replicates onto all inserted bootable floppies.	Infects any application. Increases application size by 7,000 bytes. Seeks out new hosts at 3½-min. intervals. Creates notepad and scrapbook files in system folder. Creates invisible Scores and Desktop files. Looks for specific file names for destruction.
HOW SPREAD	Booting from unknown or shared diskettes. Infects through any access to an inserted diskette, e.g., listing directories, executing programs, through software reboot sequence.	Exchange of infected diskettes. Inserting diskette into infected system.
SYMPTOMS	Copyright @BRAIN Label displayed on infected diskettes. Reboot sequences are slowed down. Excessive floppy activity for simple tasks. Program crashes for some versions of DOS. Interrupt vectors modified.	Slowdown of system. Problems with printing. System crashes. File size increase. Notepad and Scrapbook icon modifications.
POTENTIAL DAMAGE	System crash can cause loss of data. Spreads quickly to all bootable disks.	Lost data due to system crashes.
PRECAUTIONS	Do not boot from unknown floppies. Boot only from hard disk, if one exists. Write-protect all bootable diskettes.	Do not exchange disks with others. Do not insert diskettes containing programs into others' systems. Do not execute programs from unknown sources.
RECOVERY	Shut down infected systems. Reboot from a clean, write-protected original boot diskette. List directories of all diskettes, look for @BRAIN label—if found, destroy the diskette or perform DOS SYS command to rewrite boot sector. Recreate volume serial label using any available utility. (This procedure will still leave 7 bad sectors with dead virus.)	Backup all data files. Erase the infected disk and all affected diskettes. Restore system files and applications from original masters. Restore data files.
NUMBER OF COMPUTERS INFECTED	18,158	14,207
NOTES	This virus will live through software reboot.	The Scores virus changes the small MAC icon for notepad and scrapbook into generic dog-eared page icons.

*A total of 61,795 infected computers were reported; from five to 816 were infected at each company. Other viruses, excluding the six in this table, infected 6,353 of the total reported. A total of 700,000 diskettes were infected.

Israeli Virus	nVIR	Alameda Virus	Lehigh
Hebrew University, Jerusalem, Dec. 1987.	Hamburg, Germany, summer 1987.	Merritt College, Oakland, Calif., spring 1988.	Lehigh University, Bethlehem, Pa., fall 1987.
IBM PCs and compatibles	Macintosh	IBM PCs and compatibles	IBM PCs and compatibles
Generic application infector	Generic application infector	Boot infector	System infector
Infects any .COM or .EXE program. Increases program size by approx. 1,800 bytes. Infected programs are modified to become memory-resident (TSRs). Programs are infected when they are executed in infected system. Floppy or hard disks can become infected.	The nVIR virus appears in many different varieties, each with its own characteristics. The publication of the source code for this virus is primarily responsible for the variations. The infection techniques are similar, however: places nVIR resource in system file; code resource in application. Once system is infected, all applications are infected.	Replaces original boot sector with itself. Stores original boot sector on first free sector. Infects through software reboot sequence. Does not flag original boot sector as unusual.	Infects COMMAND.COM file. Changes size by approx. 20 bytes. Changes creation date and time. Activates after four infections. Destroys all system data.
Transfer of infected programs on floppies. Inserting floppies into infected computers.	Sharing of diskettes, inserting diskette into infected system. Executing of infected program.	Booting from a diskette of unknown origin. Inserting a clean boot diskette into an infected system.	Sharing infected diskettes. Inserting a clean diskette into an infected system.
General slowdown of the system. Programs disappear on Friday the 13th. .EXE files continue to grow in size until too large to execute. Available system memory decreases.	nVIR symptoms vary greatly due to the large number of varieties. Some symptoms are: system crashes; a "beep" when an application is opened; with MacinTalk installed, "don't panic" message is heard; files disappear.	Slow boot sequences. System crashes. Lost data.	Change in size of COMMAND.COM. Loss of all system data.
Some versions destroy all data on the hard disk. Stored programs will disappear.	Loss of data and programs. Frequent system crashes.	Loss of data.	Loss of all data on hard disk.
Do not execute programs from unknown sources. Do not exchange diskettes containing executable code with others. Monitor memory allocation and program file sizes.	Do not share diskettes with others. Quarantine infected systems. Do not work with original master diskettes.	Boot only from one write-protected floppy. Do not boot hard-disk systems from a floppy. Do not insert boot diskettes into another's system.	Do not transfer application programs on a system diskette. Do not insert any system diskette into another's computer. Monitor COMMAND.COM file for date/size changes.
Power down the system. Boot from a write-protected original boot diskette. Delete all executable programs on hard disk and affected floppies. Replace programs using original distribution diskettes.	Backup data files. Erase infected disks. Restore programs from original master copies (write-protected). Restore data files.	Power down the system. Boot from a write-protected original master diskette. Execute the DOS SYS command to replace boot sectors of diskettes.	Power down the system. Reboot from original write-protected system master. Delete COMMAND.COM from hard disk and all affected floppies. Restore COMMAND.COM from original master.
3,575	11,066	3,482	4,943
There was a bug in the virus that caused .EXE files to become infected over and over again. This made the .EXE file size increase until the programs could no longer fit into memory. This problem has been removed in later versions by unknown hackers.	nVIR is particularly virulent and can infect all programs within an infected system in a matter of minutes.	The Alameda virus, unlike the Pakistani Brain, does not protect the original boot sector after infection. The original instructions may be overwritten by accident. Boot failure then occurs.	The Lehigh virus has a very short activation period (four infections). Because of this, the chances of detection before data destruction is slim.

On February 15, 1988, IBM announced its most significant storage management advance in more than 20 years, DFSMS.™ This new software can manage vast quantities of information on disks and other storage devices, provide for more effective use of IBM storage hardware and improve end-user service—all automatically.

This means programmers can now spend less time controlling and more time creating.

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On February 15, 1988, IBM announced Enterprise Systems Architecture/370,™ the industry's most advanced systems architecture. Also announced was a new operating system, MVS/ESA.™

MVS/ESA enables new approaches in application design because it gives users of IBM's most powerful processors 16 trillion characters of virtual storage.

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gram may operate normally for months, or even years, without giving any signs of the infection. During this time the virus quietly replicates onto other programs within the system, and onto floppies inserted into the computer.

After an indeterminate replication period, the virus activates. This involves some type of overt system disturbance. It may be as innocuous as the display of a message or some unusual graphics, or it may involve partial or total destruction of stored data. The particular manifestation is based on an internal algorithm, which may be determined by the length of time the virus has been in the system, or by the number of programs or floppy diskettes already infected by the virus. Some viruses activate based on the number of times the infected host program has been executed. Others activate on a given day and time, such as noon on any Friday the 13th. Regardless of the algorithm used, activation usually means bad news.

Viruses can be grouped into three categories: boot infectors, system infectors, and generic application infectors.

Boot infectors attach themselves to the boot sectors of floppies and hard disks. They gain control of the system when it is initially booted and remain in control at all times. They monitor all system activity by trapping software interrupts, and watch for the insertion of new floppies into the drives. When a diskette is inserted and accessed for the first time, the virus transfers itself to sector 0 of the floppy, then it infects the next system booted from that floppy. Booting from an infected floppy is the only way this group of viruses can infect a new machine.

System infectors attach themselves to at least one operating system module or system device driver. They can infect command interpreters, system I/O routines, or special-purpose drivers for attached hardware. They gain control after system boot—during operating system initialization—and stay active in the system at all times. They watch for the insertion of system diskettes into one of the floppy drives. When this occurs, the virus replicates onto the system files.

Generic application infectors are able to infect any application program. They gain control when an infected application is executed, and they scan the system looking for additional hosts on hard disks and floppies. When found, they attach to the new hosts. After the virus scans and infects, it generally passes control back to the application program. Generic application infectors are the most widespread of all viruses.

Viruses have been transmitted across local area networks, through access to bulletin boards, and through a number of remote computer-to-computer communication links. In the personal computer arena, however, the overwhelming majority of infections occur because of program or data sharing through infected diskettes.

Boot infector viruses, for example, can infect in no other way. They require that a diskette be the transfer medium from machine to machine. System infectors also prefer diskette transfer, and they wait for system diskettes to be inserted into an infected machine to continue the replication process.

Diskette sharing and transfer are widespread practices among personal computer users. Even in large corporate environments we frequently find PC users sharing machines and resources. A machine with the only high-quality laser printer in the department, for example, may frequently be borrowed by other users in the department. These users will typically bring their own diskettes with files to be printed. If a diskette happens to be infected, then the machine with the laser printer becomes infected, and thereafter, every user will take away an infected diskette. The virus thus spreads rapidly throughout the department.

☐ **AN INFECTED PROGRAM MAY OPERATE NORMALLY FOR YEARS, WITHOUT GIVING ANY SIGNS OF THE INFECTION.**

What mechanisms do viruses use to attach themselves to other programs? Viruses infect in one of two ways: they attach to an existing piece of code, or they entirely replace a piece of code. Certain boot-sector viruses use the latter approach. They replace the entire boot sector with a copy of themselves. In effect, they become the new system boot program. Most viruses, however, choose to attach themselves to an existing program. This approach alleviates the problem of the virus having to duplicate the functions of the program it replaces.

How Viruses Are Spread

A virus attaches to a program either by binding itself externally to the program or by implanting itself inside the program. If it attaches externally, then the program size usually changes, and the virus risks detection from a visual inspection of di-

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On April 19, 1988, IBM introduced an advanced version of its premier relational DATABASE 2 (DB2™), providing substantial performance improvements over the previous release.

IBM's new DB2 Version 2 offers significant new functions such as referential integrity, which allows customers to maintain data relationships without the need for complex programming.

Responding to customer requests, these changes increase database performance and programming productivity.

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On May 13, 1988, IBM unveiled its plans for the Advanced Automation System (AAS). This system is designed to help the Federal Aviation Administration's air traffic control system safely handle the estimated 60 percent increase in U.S. air traffic by the 21st century.

Thank you for flying IBM.

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rectory listings or other external observations of the program. If the virus chooses to insert itself within its host, then it must find hosts with enough internal free space to hold the virus. Most programs do not have sufficient free space. Thus the virus has a more limited number of receptive hosts and will spread more slowly.

Evidence suggests that virus designers have weighed the above considerations and opted for external attachment. These viruses attach by replacing the initial instructions of the host program with new instructions that branch to the main body of virus code. This code is usually tacked on to the end of the host application. After execution of the virus, the original program instructions are restored and control is passed to the host.

☐THE PROGRAM SIZE USUALLY CHANGES IF A VIRUS ATTACHES EXTERNALLY, ALLOWING VISUAL DETECTION.

There are ways to limit exposure to virus infection. Risk reduction can be divided into two areas: antiviral tools and safe user practices.

Many virus infections can be easily prevented with the appropriate tools. A number of software products are available that provide varying degrees of protection, and should be considered as valid tools in antiviral efforts.

Antiviral Programs

Each class of virus uses a different mechanism for infection, and each individual strain uses its own unique methods for activating and corrupting the system's data. A cursory review of a number of disassembled viruses would lead one to believe that no technique could possibly catch all existing viruses, let alone new ones not yet sampled. This assumption, however, would be wrong. The situation is neither as hopeless nor as complex as it first appears.

To understand how viruses can be effectively neutralized, we must first appreciate some fundamental limitations of viruses—their weak points. Also, we need to extract features that are common to all viruses and turn these universal features to advantage. This may seem rather daunting, but in fact it has already been accomplished, and the results have been embodied successfully in a number of antiviral products.

The first and most important limitation that all viruses possess is that their host

The Recovery Period: Preventing Reinfection Is Key

The main problem in recovering from a virus is not the loss of data, but the near certainty of reinfection if the proper procedures are not followed. Nine out of 10 installations that get infected experience a relapse within a week of "cleaning out" the virus. The causes of these reappearances can be traced to two things. First, many viruses do not go away after a warm boot. The Pakistani Brain is such a virus. Second, viruses initially infect fixed disk systems by way of a floppy diskette. After infection, every floppy that has been placed in the system is also likely to be infected.

When an infection is detected, follow these procedures:

1. Determine the extent of infection. If the virus has not attacked any fixed disks, go to step 12. If the virus has infected the boot sector only, see the addendum.
2. Power down the infected system.
3. Retrieve the original system diskette from the distribution package. Write-protect it. Place it in the floppy boot drive and power up the system.
4. Ensure that the system has booted properly.
5. Back up all nonexecutable files from all directories onto newly formatted floppy diskettes or to a tape backup unit. If backing up to another fixed disk, ensure that the disk has not been infected. (If there are any doubts, assume that it is). Do not use the backup utility on the fixed disk. Use a utility from the original package.

(Note: At no point in these procedures should you execute *any* program from the infected fixed disk!)

6. List all batch files on the infected disk. If any line within any of the batch files seems unusual or unfamiliar, do not back up. Otherwise, include the batch files with the backup.
7. Perform a low-level format of the infected disk.
8. Restore the operating system to the fixed disk.
9. Restructure your directories.
10. Replace all executable programs from the original distribution packages.
11. Restore the files that had been backed up.
12. Locate all floppy diskettes that may have been inserted in the infected system within the past two years. (It sounds extreme, but if this and subsequent steps are not followed, you can be guaranteed reinfection within a short period of time).
13. At your discretion, either destroy all such floppy diskettes or proceed with the following steps.
14. Back up all nonexecutable files onto newly formatted floppy diskettes.
15. Format the suspect diskettes.

Addendum

If the virus is a boot sector infector, the recovery process is somewhat simplified. Since boot infectors do not infect executable programs, they can be removed by replacing the bootable system on the affected drive. The procedures are:

- Power down the affected system.
- Boot from the original write-protected system diskette.
- Replace the operating system and boot sector on all affected devices.

The above procedures will leave the virus intact on the additional bad sectors originally allocated by the virus, but these viral segments will be deactivated.

targets must be executable segments of the computer system. That means they can only infect other programs, whether boot segment programs, operating system elements, or applications. They cannot effectively infect data files, spreadsheets, tabular information, or any raw data elements within the system. This may seem like small comfort, but in fact, as will shortly be demonstrated, it is a limitation that can be used to great advantage in the war against viruses.

The second limitation is that any infection, no matter how sophisticated, must change the infected segment of the system in some fashion. The virus either entirely replaces a segment of the system or it modifies the existing segment. If it attaches to an existing program, then it changes the beginning, the end, or some part of the middle of the program. If it hides in vacant areas of the disk, then those areas suddenly become no longer vacant, and are modified. If the virus stores the original boot sector in some unobtrusive place, then the move itself changes the system. The rule is this: any infection leaves some residual trace.

The third weakness is that if the virus is to live and multiply, then its program code must be run, or executed, at some point. That is, the virus must place itself in a position to get control of the computer at least once after the initial infection—otherwise the virus will never be able to replicate or activate.

On June 2, 1988, IBM introduced seven new desktop products, including the IBM Personal System/2® (PS/2®) Model 70 386.

The Model 70 386 features high-speed memory and IBM's Micro Channel™ architecture, which improves data integrity and allows users to run large, multiple programs more reliably and efficiently.

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That's a lot of desktop options for almost any desk.

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On June 21, 1988, IBM announced the Application System/400,™ the largest product introduction in IBM's history. This powerful, easy-to-use computer system is designed to grow as fast as customers' needs and provide consistency in applications, and is IBM's first product family to conform to IBM's Systems Application Architecture.™

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Say good-bye to future shock.

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On June 28, 1988, IBM introduced ImagePlus,™ a new image processing system that will help businesses that process large amounts of paperwork reduce costs, improve customer service and design more competitive products and services. This system will improve the way a business handles the paper it receives from, and sends to, its customers.

Businesses using ImagePlus will be able to take an "electronic picture" of customer letters, sketches and even photographs and move them instantly through the business for processing.

Can you picture that!

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This implies that the virus cannot just attach itself to programs at random. It must know something about the general structure of host programs and attach itself so that it executes whenever the host program is executed. This need to position itself (or at least parts of itself) in specific areas of the host program is a limitation that can also be used to advantage by antiviral systems.

In sum, viruses must infect specific types of data (programs), they must position themselves (at least partially) in limited and specific areas of the programs, and the act of infection invariably causes some change in the system. These points may not sound like much to go on, but when they are viewed in the context of the average computing environment, a great deal can be made of them.

A description of how the various types of antiviral systems take advantage, each in their own way, of one or more of the above weaknesses, will explain how these three points can be leveraged.

Three Types of Antiviral Programs

There are almost as many approaches to developing antiviral software as there are types of viruses. On analysis, however, the antiviral programs fall naturally into three different categories:

- Infection prevention products. These products stop generic viral replication processes and they prevent viruses from initially infecting the system. They are usually not specific to individual viruses, but protect against all classes of viruses.
- Infection detection products. These products detect an infection soon after the infection has occurred. They generally identify the specific area of the system that has become infected. Like infection prevention products, they identify generic infections rather than individual viruses.
- Infection identification products. These products identify specific viral strains on systems that are already infected, and usually remove the virus—returning the system to its state prior to infection.

Infection prevention programs remain resident in a computer's memory at all times. They monitor all system activity, watching for characteristic signs of viral replication. These programs filter the file accesses (reads and writes) attempted by other programs. They monitor the programs that load into and out of memory. They check all requests for operating system services. They keep watch over system tables and system control structures. Virtually every aspect of the system's activities is monitored and checked as it occurs.

These antiviral programs all wait for the same event: an indication that a virus is attempting to infiltrate the system, which nearly always is indicated by an attempted access to one of the executable programs in the computer—the boot segment, the operating system, or an application program. When such an access is attempted, the program freezes the system (before the virus can complete replication) and flashes a warning message to the system user. The virus can then be harmlessly removed.

How, though, does the antiviral program distinguish between a virus trying to access a program and any other harmless function trying to do the same thing? How is the virus's access different from that of a word processor or a database program? The answer is that in the normal course of events a word processor would never attempt to access or write to another program. Neither would a database system, nor a spreadsheet program, nor a graphics package. In fact, normal modifications of, or accesses to, executable segments of a computer are extremely rare. Such accesses would take place only if the program in question were being replaced by a newer version, or was being initially loaded into the computer.

At least this is the theory. In practice, however, there are a number of normal computer system functions that can cause these types of antiviral programs to believe that a virus is present. When this occurs, a false alarm is sounded. One measure of the quality of such programs is the frequency of false alarms. Well-designed, sophisticated programs will present few. Poorly designed programs may cause so many that the program becomes useless.

Prevention programs can also be fooled by the viruses themselves. Some viruses use infection mechanisms that are specifically designed to avoid this kind of detection. Such viruses use access techniques that are difficult to monitor or prevent. These techniques involve writing directly to the hardware that controls the storage devices, or using I/O calls that bypass the antiviral checking function. These viruses are more difficult and time-consuming to implement but they can be, and are being, created.

A final weakness of prevention programs is that they cannot keep boot segment infections from occurring. This is because boot segment infections occur as the system is powered up or rebooted. At that point, the infection prevention program has not yet been loaded, and is therefore powerless. This is a fundamental architectural drawback of this class of protection device, and technical advances are not likely to overcome this limitation.

Infection Detection Programs

In spite of the above three problem areas, infection prevention programs can provide a statistical margin of safety for the average computer user. It may be better to catch and prevent, say, 80% of all infections than not to catch any at all.

□ VIRTUALLY EVERY ASPECT OF A SYSTEM'S ACTIVITIES IS MONITORED BY ANTIVIRAL PROGRAMS.

Infection detection programs work on the principle that virus infections can be detected after they occur by locating the infection traces. These traces are the modifications or changes in the system made by the viruses during the infection process. These programs are generally more reliable than infection prevention programs, and they are effective against all classes of viruses.

Infection detection programs work in one of two ways: through vaccination or through a snapshot technique.

Vaccination works by modifying the programs in the computer to include a self-test mechanism within each program. The test mechanism uses a checksum or other mathematical or algorithmic technique to determine if the sequence of instructions within the program has been altered. This self-test executes each time the program runs, and it checks the program to see if any changes have been made since the last time the program was executed. If the program is in any way different, a virus infection is assumed, and a warning to the user is displayed.

Vaccination has a number of major drawbacks. The most important is that many critical programs in the computer, including the boot segment, are difficult—often impossible—to effectively vaccinate. Remember that boot segment viruses generally replace the boot segment in its entirety. Consequently, the vaccinated boot sector never gets a chance

On July 19, 1988, IBM introduced Disk Operating System (DOS) software, version 4.0, with an easy-to-use shell and expanded memory functions.

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On July 19, 1988, IBM announced three new RISC Technology systems, increasing RT® System performance by up to 25 percent, furthering IBM's commitment to customers using high-performance UNIX operating systems.

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On July 26, 1988, IBM introduced the world's most powerful general-purpose processor.

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But even though it can help make weather reports more accurate, it still can't change the weather.

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to execute after the infection, and therefore can never alert the user. Even if it could be executed, the self-test would not identify any problems, since the virus only moved the boot segment and did not otherwise change it.

The second problem with vaccination is that no matter how effective the self-test algorithm may be, a virus that infects a vaccinated program invariably gains control *before* the self-test mechanism executes. From this vantage point, the virus can still replicate, possibly activate, and even (with sophisticated viruses) disable the self-test mechanism before it can execute.

Despite these drawbacks, the vaccination form of viral detection products can still provide a degree of protection. As with infection prevention products, it is better to partially protect than not to protect at all.

Perhaps the most effective form of protection available today is provided by infection detection products that use an efficient snapshot technique. Snapshot programs work by logging all critical information in the system at the time of initial installation. Thereafter, a check routine is periodically run to compare the current state of the system with the original snapshot. If traces of infection are detected, the affected area of the computer is identified and the user is notified.

Snapshot programs have the advantage that all parts of the system can be checked, cross-checked, and compared at the same time. Because of this, boot sector infections, operating system viruses, and generic viruses can all be detected. A second advantage is that the snapshot file and the compare program can be kept off-line, that is, outside of the computer; inviolable.

Snapshot techniques have been very successful in identifying virus infections soon after they occur. One possible drawback with some of these programs, however, is that the verification techniques (checksums or other math algorithms) can take a considerable time to check an entire system. Some newer products do employ innovative techniques to speed up this process. A few products, for example, use a technique called "branch address maps" to check executable programs for traces of infection. Such products are able to verify entire computer systems with hundreds of programs, including the boot segment and all operating system files, in a matter of seconds.

The check routines used by snapshot programs can be run at any time to see if a virus has invaded the computer. Most programs, however, also provide an automatic check function. This function is executed periodically, for example, each time the computer is turned on or rebooted. If an infection is identified, these snapshot programs will zero in on the specific program or area of the system that has been invaded. Removal is usually a straightforward process for most viruses if identified early enough, and the process is normally documented in the product's manual.

These products are, to date, the most effective in providing protection against infections. They do have one drawback, however. There is a small risk that the virus will activate before the detection program can be run to check for it. For example, you may get infected the morning of Friday the 13th by a virus that activates on Friday the 13th. In this case, the check program would not be executed until the next time you reboot or power the computer on—probably the following day. In the interim, the virus would have activated and wreaked its havoc. The probability of such occurrences, however, is low.

Infection Identification Programs

What if your system is already infected, and the virus has spread to every conceivable part of the computer? What if it has even begun to activate, destroying a good part of your data and infecting all 200 of your floppy disks? It's a little too late for prevention, and detection is all too obvious.

When this happens, the third category of antiviral products comes into play. These products seek out specific strains of viruses in every corner of your system. When they find them, they deactivate them or completely remove them.

These products work by looking for specific characteristics of individual viral strains. They may scan the system for a particular segment of virus code, or look for virus labels or copyright flags. They may look for specific system interrupt modifications that are unique to the virus, or for specific file names or key data in fixed disk addresses. When any of these flags are found, the virus is tracked down and eradicated.

On the surface, such programs appear to be panaceas. They all have one extremely limiting factor, however—their designers need a working sample of the virus they are attacking before they can come up with an antidote. This means that a virus must first be identified, isolated, captured, and disassembled (a process that may take months) before the designer can get down to work. Next, the design has to be implemented, and then the finished product must be packaged and marketed. The complete cycle may take one or two years from the time the virus is first placed into circulation.

Thus, infection identification products will always be behind the power curve of the antiviral war. But a program that performs the task of cleaning out the virus from thousands of infected disks is many times faster, cheaper, and more effective than any manual method of recovery from infection, and can be invaluable to large organizations.

☐ SNAPSHOT TECHNIQUES CAN SUCCEED IN IDENTIFYING VIRUS INFECTIONS SOON AFTER THEY OCCUR.

Safe User Practices

The implementation of appropriate practices for computer users within an organization is equally as important as the use of antiviral programs. A few simple procedures can greatly reduce the exposure to virus infections (for tips on recovery once infected, see "The Recovery Period: Preventing Reinfection Is Key").

1. First and foremost, never boot from any floppy other than the original write-protected diskette from the original distribution package! Most of the boot sector infector viruses can infect your system *only* if you boot from an infected floppy diskette. Booting from borrowed, unknown, or multiple diskettes greatly increases the opportunity for infection.
2. One and only one boot diskette should be assigned to each and every floppy-based PC (systems without a fixed disk), and that diskette should be *clearly* labeled as the boot diskette for that system.
3. If you have a system with a fixed disk, *never* boot from a floppy drive. The only exceptions to this involve recovering from a viral infection.
4. Treat public domain and shareware software with caution. If possible, limit use of such programs to systems without fixed disks. If you do use them on fixed disks, allocate separate subdirectories for

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With the introduction of five new software products on September 20, 1988, IBM became one of the first U.S. manufacturers to incorporate into their machines systems network programs based on international standards.

Taking advantage of Open System Interconnection (OSI), a set of international standards and protocols, IBM computers are now "multi-lingual": they can talk to networks of IBM machines or any other manufacturer's.

And that's got everybody talking.

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On October 12, 1988, IBM entered into an agreement with Steve Jobs and NeXT that allows IBM to bring the NeXT advanced graphical interface to IBM's AIX™ workstations.

Who knows what's next?

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the public domain programs. This will reduce the chances of exposure since some viruses limit their replication activities to the current subdirectory.

5. Create meaningful volume labels on all fixed and floppy disks at format time. Develop a habit of checking volume labels each time a Dir command is executed. Keep a lookout for changes in the volume labels.

6. Watch for changes in the pattern of your system's activities. Do program loads take longer than normal? Do disk accesses seem excessive for simple tasks? Do unusual error messages occur with regularity? Do access lights on any of the system devices turn on when there should be no activity on that device? Do you have less system memory available than usual? Do programs or files disappear mysteriously? Do you suddenly notice a reduction in available disk space? Any of these signs can be indicative of viral infections.

7. If you are in a corporate or multisystem environment, minimize the exchange of executable code between systems wherever feasible. When using resources on someone else's PC (a laser printer, for example), transfer the necessary data on a diskette that contains no executable code. Also, do not use diskettes that are bootable or that contain system files.

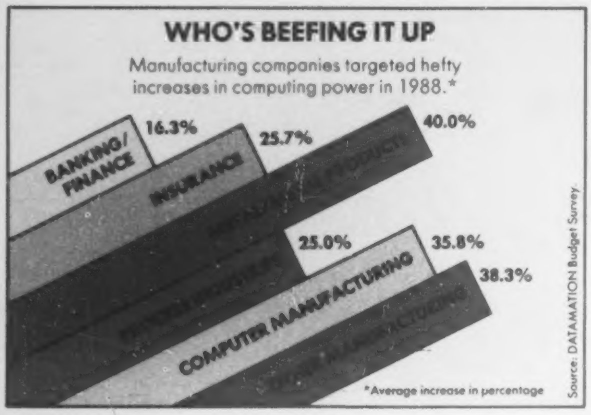
☐ WATCH FOR CHANGES IN THE PATTERN OF YOUR SYSTEM'S ACTIVITIES.

8. If operating in a network environment, do not place public domain or shareware programs in a common file server directory that could be accessible to any other PC on the network.

9. If operating in a network environment, do not use the file server node as a workstation. Allow no one other than the system administrator to use the file server node.

10. If using 3270 emulators connected to mainframe systems, keep all 3270 emulation software together in a separate subdirectory and do not include *any* executable code in the subdirectory that is not part of the emulator suite. If possible, limit such terminals to 3270 emulation only, and remove all other software from the disk. 3270 emulators are the major gateways through which viruses jump from PCs to mainframes. ▭

John McAfee is an industry consultant and president of Interpath Corp., Santa Clara.



Source: DATAMATION Budget Survey.

JIT Arrives On Time At NEC Plant

The just-in-time (JIT) manufacturing methods that migrated from Tokyo to the States and beyond will be arriving not a minute too soon at NEC Information Systems' plant in Boxborough, Mass. JIT tactics will be increasingly deployed at the plant as the company shifts from imported to U.S. parts in the production of dot matrix printers and Powermate PCs. The shift, which started last summer, should help the Japanese manufacturer reach its goal of boosting local content in those wares from 5% to 40%.

The JIT parameters and criteria that establish precise, narrow delivery windows for supplies to be received will be fed through the Honeywell Manufacturing System (an MRP II package) into NEC's Honeywell DPS 8/49 mainframe. The first U.S. supplier on the JIT list will be NEC's printed circuit board subcontractor. The domestic-part procurement strategy made possible by JIT is mandatory if NEC is to be a long-term competitor in the American computer market, where product life cycles are accelerating at a fast clip.

"You must build a product closer to the market to be able to react more quickly," explains Herb Spivak, vp of manufacturing at the Boxborough facility. "If you're ordering materials for yesterday's product, you're in trouble."

There are economic considerations as well. "The Japanese have the technology," he notes, "but they can't fight against the economics of their strong currency."

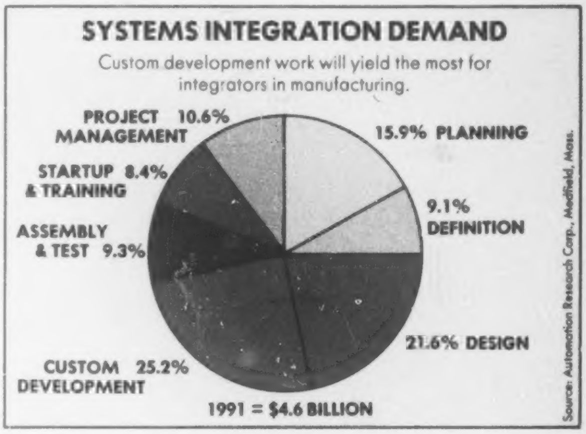
The Japanese also place "a heavier emphasis on testing and quality control," according to Spivak. "Every week, we send to NEC in Japan very detailed reports of our test results and information on any defects or assembly errors found," he notes. If there's a change or a problem develops, "they'll ask for more data. They're very attentive to the final quality of the products coming off their assembly lines." ◀

PCs Make Mark in Plants

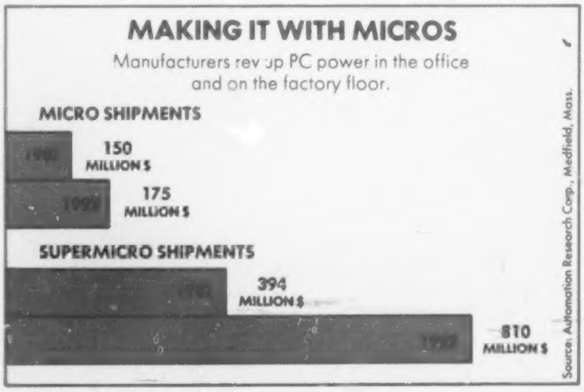
More and more manufacturers are making and moving their products with the help of micros. Automation Research Corp. of Medfield, Mass., predicts that for U.S. industrial applications the value of microcomputer shipments—from low-end machines through dedicated workstations—will skyrocket in the next few years.

The growth at the high end of the small systems spectrum is much more spectacular than at the lower end. ARC expects that the value of shipments of 32-bit PCs will more than double to $810 million by 1992 from $394 million in 1987; 16-bit units used in industrial settings will grow slightly to $175 million from $150 million during that time. Workstations, which are not included in this ARC tally, will be the real workhorses on the factory floor. The research house forecasts that between 1987 and 1992 the value of workstation wares shipped for industrial automation chores will be over $145 million, up from $63 million.

Design work—one of the more complex industrial automation chores—is also getting a big boost from small machines. A survey conducted by the *Anderson Report* found that PCs were the most popular CAD tools among its sample, which was skewed toward larger companies. Out of a survey total of 13,588 CAD seats, 66% were PCs and 22% were workstations. The most frequent applications were two-dimensional and three-dimensional CAD, followed by solid modeling and electronics. ◀



Source: Automation Research Corp., Medfield, Mass.



Source: Automation Research Corp., Medfield, Mass.

Software Speeds Up VW

Next month, West German automaker Volkswagen will be cruising in the fast lane with a new system designed to speed up the purchase of materials needed in car construction. The software being developed for the $31.6 billion car company by French firm Cap Gemini Sogeti will churn out computer-aided estimation data and information pertaining to the frequency of specifications and options such as auto color and transmission type.

Estimates of the need for various option combinations, calculated over several months, will enable Volkswagen to order and stock just the amount of parts it needs, thus reducing its inventory-carrying costs, according to the company. The $850,000 system, dubbed Prisma, will be up and running full speed ahead in March on an IBM 3090 mainframe operating under MVS and IMS. ◀

Charts by Catherine Francis

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INTERNATIONAL EDITION MARCH 1, 1989

SPECIAL REPORT: 1992 Brings IS Urgency to Europe

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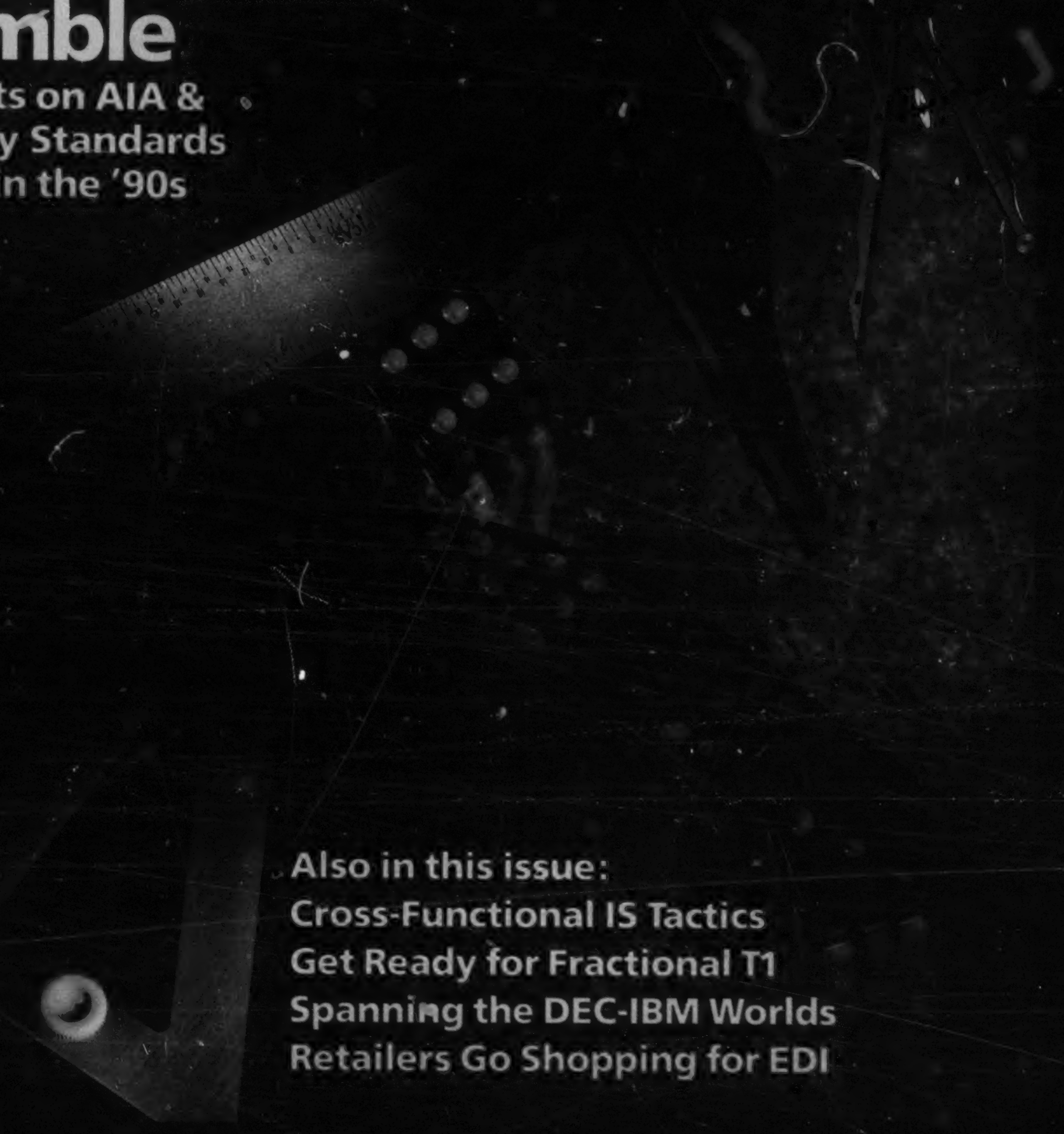
DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

Digital's Architectural Gamble

DEC Bets on AIA & Industry Standards To Win in the '90s



Also in this issue:

- Cross-Functional IS Tactics
- Get Ready for Fractional T1
- Spanning the DEC-IBM Worlds
- Retailers Go Shopping for EDI

MAR 1, 1989

VOLUME 35
NUMBER 5

DATAMATION®

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

Digital's Architectural Gamble 14

BY GARY McWILLIAMS Nearly six years ago, Digital Equipment Corp. boldly bet its future on VAX/VMS, the ace in its technological deck of cards. One architecture for all time, for all purposes. But even as VAX/VMS enjoys architectural primacy, DEC is preparing a new, even bolder gamble. This time the wager is on an umbrella architecture that, while enveloping VAX/VMS, consists of a set of high-level interfaces independent of the operating system and hardware. Response to these interfaces, collectively called Application Integration Architecture (AIA), could determine DEC's future.

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Cover Photography by Craig Cutler

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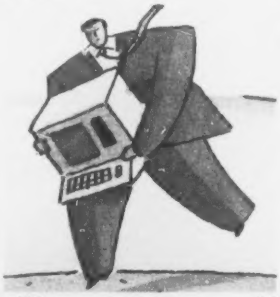

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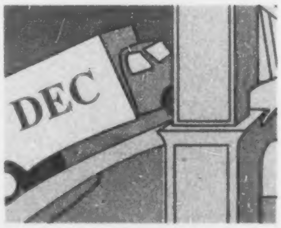

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BY GARY McWILLIAMS and TIM MEAD In an exclusive interview, Digital's founder and president Ken Olsen says Application Integration Architecture strategy is a natural evolution because DEC has always been a leader in standards. According to Olsen, Digital's support of two operating systems represents just a small shift in the company's 32-year history, although in the same breath he calls it a major change.

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With Europe's Market Unity Comes IS Urgency 28

BY PAUL TATE The creation of a single European market means opportunity for IS-savvy enterprises that can harness networks and open systems to their utmost advantage. The new, pan-European market will have 300 million affluent people and a gross domestic product of $4.4 trillion.

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Spanning the DEC-IBM Worlds 45

BY DAVID STAMPS Almost everyone has stepped up efforts to connect the DEC and IBM domains, including the giants themselves. Some of IBM's customers report that IBM is talking quietly about a direct gateway to DECnet in the not-too-distant future. But the connectivity job is far from finished, and third parties and users will have to do much of the work.

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Retailers Go Shopping for EDI 53

BY LEILA DAVIS As the cost barriers fall, retailers look more closely than ever at Electronic Data Interchange (EDI) services, which promise to be the biggest thing to hit retail since the Cabbage Patch Doll. There will be bargains for retailers' suppliers and customers, too. The first to buy in will realize the greatest savings.

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BY SUSAN KERR A new wave of fractional T1 service offerings will emerge this year for smaller firms seeking T1's speeds, and network users will be able to sign on for a service with a multiple of from one to 24 times 64Kb. Pricing for these services may ultimately determine their success.

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BY JEFF MOAD In order to link design, manufacturing, distribution, and service, companies are reorganizing their information systems along cross-functional lines. Companies hope to be more responsive, get products to market quicker, and spot potential problems earlier.

INTERNATIONAL

Special supplement, not included in all issues. 76-1

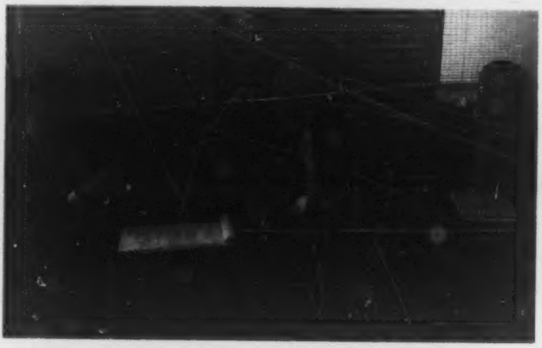
The Start of Something Big in IS

Covering a major story challenges the best of journalists. Equally challenged are the consumers of the information—you the reader. You're asked to make sense of what's provided to you. And you're often required to act upon that precious knowledge—today in some cases, tomorrow in others. That's where we find ourselves with this issue on two very different subjects—Digital Equipment Corp. and 1992.

In DEC's case, Boston Bureau Manager Gary McWilliams has spent the year since he last did a major report on the company watching the world's number two computer maker become a force in the fast-paced world of IS standards.

The key, he discovers, is understanding DEC's newly emerging Application Integration Architecture, the subject of our cover story, "DEC's Architectural Gamble," p. 14. AIA, as it's known, is far more ambitious than the company's first, eminently successful attempt at a single architecture, VAX/VMS, and has significantly greater meaning for major systems users. Although DEC executives won't say it, AIA represents Maynard's answer to Armonk: it's AIA vs. SAA, IBM's Systems Application Architecture.

McWilliams writes, "For DEC users, both old and new, the payoff of the AIA initiative could be freedom from VMS . . . . The potential risk, however, is that AIA means change, perhaps in how applications are handled and certainly in a new round of interfaces to deal with, and the introduction of a still unknown IS cost factor."



Photograph by John Thompson

DIGITAL'S KEN OLSEN talks to (left) Boston Bureau Manager Gary McWilliams and (right) Editor-in-Chief Tim Mead.

In measuring the risk that users who wager their companies' IS futures on AIA might take, McWilliams talked to more than 20 sources—users, competitors, consultants, and DEC executives. Most insightful, perhaps, are the comments of the architect himself, DEC founder and president Kenneth Olsen, whom DATAMATION interviewed just one day after his most important open systems product announcement to date.

1992 Is Here Today

Charting the technical directions of a $12 billion standard-setter is no small feat. But it's less daunting than figuring out what 12 nations are going to do in four years when they bond together with IS glue to form one of the world's largest trading blocs.

International editor Paul Tate with the assistance of Lauren Murphy and DATAMATION's foreign correspondents takes on 1992, a year that's become synonymous with European unity. Tate, who in the past has had no trouble confronting thorny issues—taking on Russia, China, and information-age vulnerability for DATAMATION in recent years—expresses uncharacteristic uneasiness with his findings. "Most companies are just entering the IS planning stage, but are doing so with a worrying mix of confusion and anxiety. There's no clear vision of what the changes will bring."

Perhaps the best way to begin preparing for the major economic event of the next decade is to read "With Europe's Market Unity Comes IS Urgency," on p. 28. It's the beginning of a very important IS story.

Tim Mead

—*Tim Mead, Editor-in-Chief*

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With Europe's Market Unity Comes IS Urgency

The creation of a single European market means opportunity for IS-savvy enterprises that can harness networks and open systems to their utmost advantage.

BY PAUL TATE

These days, it seems, 300 million affluent people and a gross domestic product of $4.4 trillion are needed to make a world market. That's what the 12-nation European Commission (EC) in Brussels hopes to create by the deadline of midnight on Dec. 31, 1992.

Although the dawn of the new frontier-free single European market is four years away, one fact is becoming clearer with every passing business day—information systems will be critical to success in the new environment.

> The intention is to have all our major systems running in one center—probably in West Germany.
>
> PIERRE TORFS
> GENERAL MOTORS CONTINENTAL

"Information technology will become a key component in the drive for European market share," predicts Gordon Ross, director of the computers and communications division of the PA Consulting Group in London. "But the IS executive is faced with the difficult task of having to plan and prioritize in the face of uncertainty. This is not the usual uncertainty of the effects of rapid technological advances, but the uncertainty of a business environment within which the IS function is operating."

This is the dilemma facing many IS executives, not only those in Europe but also those working for U.S. and Pacific companies trading in the European market or with European partners. Martin Walters, manager of information technology planning for the U.K.'s National Westminster Bank is one executive who is now hard at work trying to meet the challenges of 1992: "I have to ensure that whatever the bank wants to achieve with its European strategy, we can support it. But I'm still not sure just what the implications of 1992 will be for our IS operations or what repositioning we will have to do. We have set up a 1992 strategy group but I don't expect to have a plan ready for around six months."

DATAMATION research in Europe, the U.S., and Japan shows that 1992 IS plans are going to have to take account of a vast range of IS issues. The following are the most significant consequences of a single European market for the global IS community:

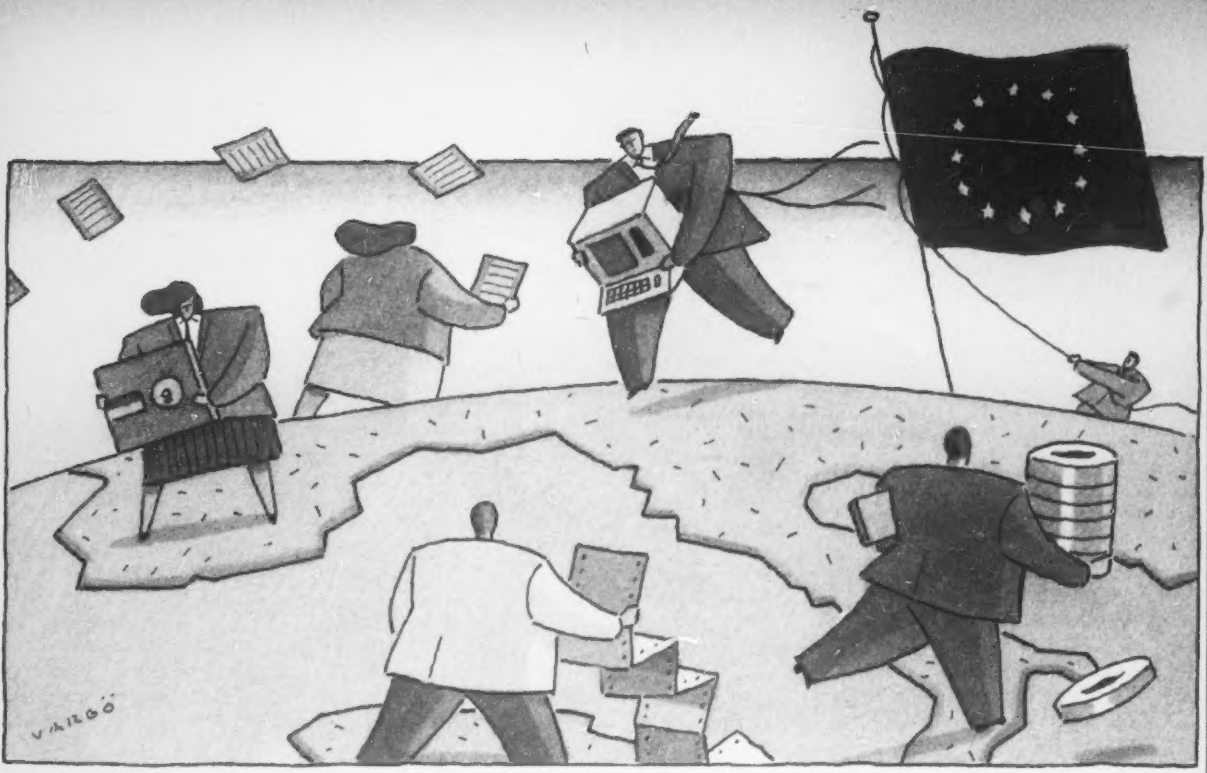
- European market expansion, liberalization, and perhaps protectionism;
- widespread reviews of corporate and government IS strategies in Europe;
- changes to existing systems and cancellation of inappropriate development projects;
- planning and purchasing confusion;
- fewer European IS suppliers, and lower prices for IS goods;
- cheaper and more coordinated European networking and network services;
- high demand for electronic data interchange (EDI), multilingual software, development tools, expert systems, executive information systems, and distributed databases;
- boost for open systems;
- the rise of the European network and data center;
- the ascendance of the European IS director.

Many of these IS trends are already under way, but the 1992 deadline will send them into overdrive.

Corporate Giants Accelerate IS Push

Many of the world's largest organizations are already taking the single market changes seriously (see "Chase Builds European Power Center" and "Honda Welcomes Eurostandards"). West Germany's Siemens is acquiring companies in other European countries even as it painfully restructures; Japan's Honda is expanding its operations across Europe; and dozens of international companies in nearly every industrial sector are taking on debt to fund aggressive acquisition strategies.

For its part, the U.S.'s largest manufacturer is investing heavily in communications technology to



gear up for 1992. General Motors is setting up one of Europe's largest EDI networks linking 2,000 computers as a way of streamlining its trading links in preparation for the single market. "The single European market is going to have a major impact. We just have to be ready for 1992 with our customer and supplier systems," says Pierre Torfs, manager of MIS coordination for GM Continental in Antwerp, Belgium. "That's why we are investing in EDI. On the customer side, the new network will help cut out administrative overheads and harmonize transactions. On the supply side, we have major assembly plants in West Germany, the U.K., Spain, and Belgium and we buy material from all over Europe. EDI will help reduce lead times and enable just-in-time concepts to be fully used."

The formation of a single market will bring about other changes at GM as well. "There will be no more duplication of systems in our various data centers," he says. "The intention is to have all our major systems, such as material controls, running in one center—probably in West Germany where the Opel factories are."

Will Trade Really Be Free?

What lies behind all this activity is the most fundamental change to the trading structure of the European continent since the signing of the Treaty of Rome that created the European Community 32 years ago. The Single European Market will create a frontier-free trading bloc that covers Denmark, the Netherlands, Luxembourg, Belgium, the U.K., Ireland, West Germany, France, Italy, Spain, Portugal, and Greece.

By 1993 the EC hopes that many of the trading barriers between the 12 countries will be removed and the unified result will be better prepared to compete on a world scale—industrially, economically, and technologically. Removing the barriers, estimates EC consultant Paulo Cecchini, will save European companies $200 billion. Of course, there's still a long way to go. As Kalle Isokallio, president of Nokia Data in Stockholm puts it, "There will be a common market when the French drink as much beer as they do wine. Until then there'll be a French market, a Spanish market, a Dutch market. . . ."

Certainly intense disagreements on issues such as the loss of sovereignty, fears of cultural homogeny, blanket taxation, the proposed European monetary system, and the extent of border controls are helping to keep European political oratory alive.

What's more, there are growing fears in the U.S., the Far East, and among the non-EC European countries such as Sweden and Austria about the possible emergence of a 12-nation Fortress Europe that is surrounded by prohibitive trade barriers and import quotas.

Get Ready To Learn and Reassess

The road from fragmentation to unity in Europe looks as if it is going to get harder to travel in the next few years. But whatever the eventual outcome and however long it takes, the process to create a single market in Europe is already irreversible.

The effect on the world's IS community will be twofold. Regulations governing telecommunications, technology procurement, and IS standards in Europe will change significantly. Top IS execs in the U.S. and Far East with authority over their European IS operations will be on a continual IS learning curve for the next four years. And changes in the rules governing industry sectors will force companies to reassess their European operations and marketing, and thus their IS systems and strategies.

The formal proposals are the easiest to detail. Procurement orders over $100,000 from governments or public bodies must now adhere to European standards—commonly OSI networking and the X/Open common applications environment in the IS sector.

EEC MEMBERS

West Germany
United Kingdom
France
Italy
Spain
The Netherlands
Belgium
Denmark
Luxembourg
Ireland
Portugal
Greece

Illustration by Kurt Vargo

Telecommunications services and the supply of telecommunications equipment will be liberalized. National networks and services will be made more compatible between countries. Joint R&D schemes and development projects supporting the European on-line database industry are already being actively financed and promoted. New copyright law is being debated to cover software and databases.

IS Execs' Three Biggest Hurdles

These changes pale into insignificance, however, compared with the challenges now facing IS managers within their own organizations. Three main tasks face IS execs responsible for European operations. They are:

- to change existing systems to make them effective in the transition period and compliant with new laws;
- to conduct rigorous and frequent reviews of their IS strategies to ensure that they will support overall organizational goals as they adapt to a single market;
- to embark on new development projects that can exploit the new trading environment.

The specific changes will differ from country to country, industry to industry, company to company. Someone in the IS division needs to be given the responsibility for working out which legislation—from the rules on trading documentation to these setting taxation—will affect the company's business and therefore its IS systems. Accounting systems and distribution systems are likely to be the most affected.

Strategic reviews will be even more difficult. The prospect of a single market has already led to an acquisition and merger boom in Europe as companies search for the critical mass and geographic reach to help them survive in the new environment. So IS managers must prepare to put more emphasis on systems that support internetworking, standards, and open systems if they want to impose some order on the ensuing chaos of incompatibility.

For companies with limited export experience, and for those hoping to integrate various national systems, there will be the complications of multiple languages, currencies and exchange rates, variable address formats, and different cultural and business

New Regs for a New Europe

The 285 reforms proposed by the European Commission in Brussels cover wide areas of industry and life in Europe. Approximately 250 have been tabled at the Council of Ministers and about 100 have been adopted so far. Among the proposals are measures that will, if adopted, change many customary ways of doing things:

- eliminate technical barriers to trade such as differing standards and regulations in the 12 member countries;
- abolish restrictions on transfer of capital;
- harmonize trading rules for auto, pharmaceuticals, food, construction, and media and information technology industries;
- liberalize financial services—there will be single banking license, more open securities trading, common insurance market;
- liberalize telecommunications, transport, and utilities industries;
- liberalize public procurement policies of member states;
- allow free movement of professionals between member countries;
- eliminate border controls—goods will have a single transit document; and
- harmonize tax and some social laws.

Honda Welcomes Eurostandards

Selling cars in Europe is a tough business for the Japanese. Differences in national requirements, import quotas, and consumer preferences mean that auto companies have to gear their operations closely to national markets.

Though the British won't start driving on the right after 1992, many other differences will disappear.

"When the EC market integrates in 1992," says Honda spokesperson Laura Kriska in Tokyo, "Honda foresees specification regulations for automobiles, now unique to each country, becoming standardized. This represents merits for the manufacturer as well as for the customer. For example, when a customer moves from one country to another, specification adjustments will not be necessary."

That's going to make the work of Honda Europe's Parts Center in Ghent, Belgium, much easier. Ghent acts as the hub of the company's European communications center and coordinates all distribution and inventories of Honda parts. Equipped with IBM mainframes and an NEC communications processor linked into similar systems in the U.S. and Japan, the center uses both leased and dial-up lines to connect to dealers in Germany, France, Belgium, and the U.K. via the national videotex systems. Communications with other countries are switched through the Ghent center.

"I expect the single market to push the integration of systems and widen the spread of communications throughout Europe," says Honda Europe's dp manager Benny Gossens in Ghent.

Some of these plans are already under way. In the near future the Ghent Parts Center will also expand its operations to include distribution and inventory activities for vehicles. Honda's European communications network will therefore increase in strategic as well as operational importance in the post-1992 EC market. Network expansion plans call for dealer linkages to be established in the Netherlands through Honda Nederland, as well as in Switzerland, Sweden, Austria, Italy, and Finland.

But Gossens is cautious about predicting any further changes until the results of Honda's 1992 strategy group comes out with its recommendations. "There may have to be some organizational changes," he says. "The implications of these are not yet clear."

By Paul Tate (London) and Stuart Dambrot (Tokyo)

Top IS execs in the U.S. and Far East with authority over European IS will be on a continual learning curve for the next four years.

practices. That means searching out more flexible, multilingual software packages or getting better development tools to prepare new systems in-house.

The networking trend will strengthen. "The phenomenon of separate production and marketing will intensify after 1992 and call for better links between factories, distributors, and corporate headquarters," says Gianfranco Cappelli, president of the IS strategy committee for the Pirelli group in Milan.

Many IS suppliers also believe that the trading links that will support the new European economy will be based on communications. "Computer networks," predicts Frank Onians, vp of telecommunications for IBM Europe in Paris, "will be the information backbone of a barrier-free Europe. Computers and telecommunications provide the infrastructure through which businesses will be able to realize their full potential, spanning countries and linking them with suppliers, customers, and business partners."

Networks and Open Systems Are Key

This belief has led to a rash of networking announcements in recent months. Twenty-two European telecom authorities have even taken the unprecedented move of joining together to form a single company, Managed Data Network Services (MDNS), which will provide a one-stop shop for pan-European networking. The European subsidiary of industry researchers Input in London, meanwhile, predicts that the managed network services business in Europe will grow from $50 million to $220 million by the end of 1993, while the EDI sector will increase from $40 million to $260 million.

The combined need to cope with pan-European acquisition or expansionist strategies and the emphasis on networking will drive the demand for open systems in Europe, where the concept of OSI networking began in the '70s and the pioneering X/Open group was formed in the early '80s. The open systems movement has already won the backing of the European Commission, governments in Sweden, U.K., France, West Germany, and many commercial users. The DATAMATION survey reveals that almost all German users, over 70% of French users, and 30% of U.K. users expect standards to influence their choice of operating systems over the next four years.

Geoff Morris, chairman of the X/Open group, observes, "1992 is all about the creation of a wide-scale economy in Europe where information will be the life blood of successful organizations. The changing market structure means that businesses must have truly flexible systems and no single supplier will be able to provide everything they want. Open systems are going to be the answer especially for the new consumer-related systems in the finance and retailing sectors."

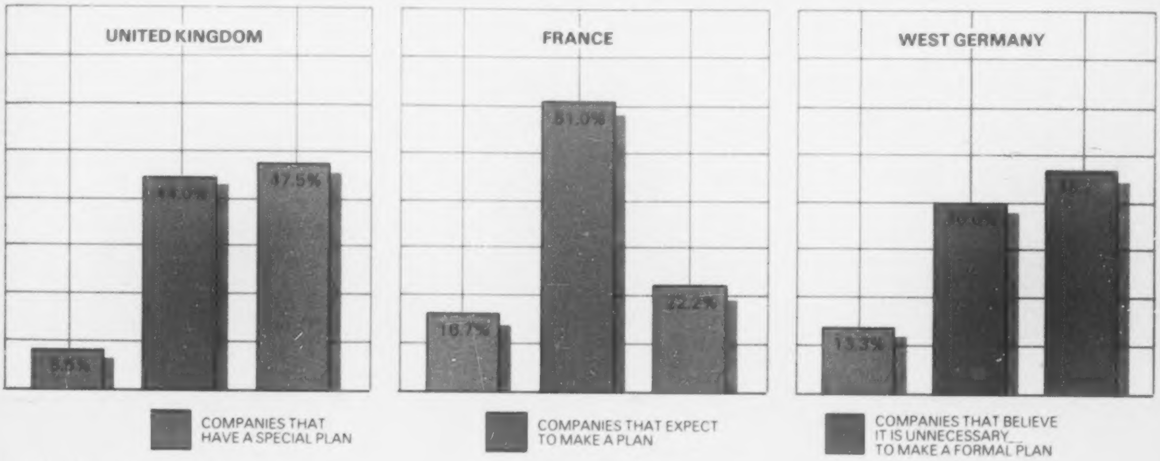
Open systems may help integration plans, but there will still be enormous pressure put onto IS departments in the run up to a single market. Since their budgets are unlikely to be substantially inflated, it means they must redeploy their resources, accept that they are going to have to work with their current systems (initially at least), and work fast to coordinate disparate IS operations before they become more of a liability than an asset to corporate progress.

What this amounts to is a widespread review of a corporation's IS strategy in the light of the single market developments. That doesn't mean current plans need to be disregarded, but they may well need to be adapted or augmented. Some projects may be canceled, and new ones put in their place.

Most of those new projects are likely to be concerned with developing competitive (aka mission critical) systems—from EDI links to marketing support applications. The competitive systems trend—which takes an innovative approach to new technologies such as expert systems, image processing, and porta-

French Users Plan Ahead

Among Europe's Big Three, the French are most aggressive in laying IS plans for 1992.



Source: DATAMATION/Price Waterhouse

Chart by Paragraphics

Centralizing IS management across Europe will likely be unavoidable.

ble equipment—is already formidable. What the prospect of heightened competition in Europe after 1992 will do, though, is to shorten the time scale for introducing these types of competitive-edge systems.

"One of the immediate impacts of 1992," says John Wishney, head of European Information Services at General Motor's subsidiary EDS, "is that companies are going to need access to a lot more information than they currently have so that they can search out new distribution channels, get credit information on their new customers and suppliers, and monitor markets."

A recent survey by the Amdahl Institute in the U.K. supports this analysis. Interviews with 700 senior managers across Europe revealed that 55% would like to see better executive information systems (EIS) being developed in their corporations over the next few years (see "Europe's Execs Want Better Information"). In fact, EIS tops the application wish-list of Europe's senior executives.

Europe's Execs Want Better Information

Nearly 700 European IS managers see decision support, OA among their top application concerns in next five years.

Application	Plans*
Executive Decision Support	55%
Office Automation	55%
Replacing Outdated Systems	50%
Electronic Trading Links	34%
International Telecom Networks	33%

*Ranked by those with specific development plans
Source: Amdahl Executive Institute

Doubts about Decentralized IS

Development pressure on IS is likely to increase, making the use of advanced development tools and software engineering technologies more necessary. To coordinate those developments across the company, IS managers will have to take a cool look at the structure of the IS function in Europe. Skills shortages, the need for better IS project management, and cost-cutting measures may suggest that the heavy decentralization of IS across many countries—traditionally the best way to avoid cross-border complications in Europe—may not be the solution.

Chase Manhattan Bank is only one international company that has come to that conclusion. Similar moves are afoot at Mobil Oil's subsidiary Mobil Data Services, which is building a center in the U.K. with an IBM host and PS/2 workstations to support the corporation's European marketing, refining, exploration, production, shipment, and supply operations. And the company is now developing European decision support and office systems. Continental Insurance, meanwhile, is building a European data and network hub that will handle European processing and development and switch data and inquiries via satellite, home to the U.S.

Centralizing the European processing operation may be a drastic measure, but centralizing the IS management function across Europe is likely to become unavoidable. European IS forums, strategy committees and joint working groups already exist in many companies operating in Europe. Their importance is likely to increase enormously as Europe exchanges its multinational status for a single market. And this forum will need a leader who has a broad understanding of European markets and processes. The era of the European IS director, responsible for continent-wide operations, may be here. IBM certainly thinks so. As Pierre Hessler, vp of IBM Europe in Paris, puts it: "Emerging fast is the European customer who is preparing for the January 1, 1993, horizon. His preoccupation and demands are decidedly international."

Those IS managers will need courage too. The process of getting the IS operation from 1989 to 1993 is going to be a tricky one. The pitfalls of legislative uncertainty, the rethink of the IS strategy, the increasing pressure to produce systems that support corporate goals in the new environment, and the rush to impose some order on the ensuing chaos are certainly going to make IS execs' lives interesting. ▭

Chase Builds European Power Center

Divide and conquer used to be the watchwords for U.S. companies crossing the Atlantic to attack European markets. By setting up operations in each country, one by one, they could make sure that they came to grips with local laws, languages, and business practices. The prospect of a single European market and common regulatory procedures has changed such battle strategies.

"The regulatory changes make you look at your competition with a heightened sense of urgency," says Elaine Bond, senior vp of corporate systems at Chase Manhattan's New York headquarters. "The single European market has added a new motivation to our plans to consolidate our operations in Europe."

Chase is expanding a major European data center in Bournemouth on the south coast of England. According to sources at Chase's London office, as many as 20 IBM System 38 machines in Chase sites across Europe will be replaced by the new center. Two IBM AS/400s costing $2.5 million have been installed to help with the transfer of work. In countries where there is a heavy volume of local transactions, France and West Germany for example, the systems will remain in place but the rest will gradually be phased out.

"We also have big iron there—3090-class machines—and Digital systems," adds Bond. "The center is going to play an increasingly important role in the area's processing activities. We have visions of architecting and rationalizing our corporate IS resources. The Bournemouth center is going to be one of the regional power centers in that strategy. This is partly a result of repositioning as a corporation and partly to prepare for the European market."

The bank for the most part is still studying how to restructure its global IS operations. But the goal is to create a network of centers that will be more responsive to customer needs and market changes, and distribute existing and new banking products rapidly across major markets like Europe.

"You've got to do everything you can to be competitive these days," Bond says.

Europe's IS Execs Predict The Future

A special DATAMATION survey on the impact of 1992 reveals that European IS managers expect a boost for standards and greater corporate recognition of the importance of IS in the march toward a single market.

BY PAUL TATE

1992: The Pulse Of Users

A common trading market in Europe may be the goal, but IS approaches to it are still mostly nationalistic in nature.

That's the conclusion of a special survey of 100 European users by DATAMATION and Big Eight accounting firm Price Waterhouse. Covering France, the United Kingdom, and West Germany, the survey found that French IS managers are ahead of their Continental counterparts in understanding the need to prepare for 1992. More than three-quarters of French users believe a 1992 IS plan is necessary; under half of German and British users think so.

Advertising and conviction explain the disparities. The French government's awareness campaign about the single market has been more successful than those in the other countries. Besides, many U.K. and German firms regard the single market as an extension of existing trends rather than as a new ball game.

Not many companies in the three countries have actually prepared a specific plan so far; France has the largest number of companies (17%) that have a plan, followed by 13% of West German companies and only 9% of U.K. firms. French users are certainly taking the changes very seriously. Almost 40% predict that preparing for 1992 will delay the development of their mission-critical systems.

There is more consensus between the three markets on other issues, though. The overwhelming majority (90%) of European users feel that the emergence of a single market will reduce the number of hardware suppliers in Europe, thus reducing the complexity of choice.

Prices are also likely to fall due to the benefits of the economies of scale, the effects of a reduction in tariff barriers, and increased competition. While around 40% of French and German users expect a reduction in the number of software suppliers as well as hardware suppliers, in the U.K. that expectation is higher—with more than 60% predicting fewer vendors.

Reflecting the trend in West Germany to tailor systems, users are confident that there will still be many systems development contractors around in the New Europe. That doesn't mean the software package market is in trouble. As one respondent put it: "One of the main advantages will be to establish common European core applications through the sensible use of package solutions."

A New Era for Standards

In fact, the greater standardization of systems—both those from suppliers and those being used within user corporations—is likely to be one of the most significant consequences of the single market. One French user predicts that there will be "a standardization of information systems in all European countries for our internal users and agents. We

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The Acceleration of Standards

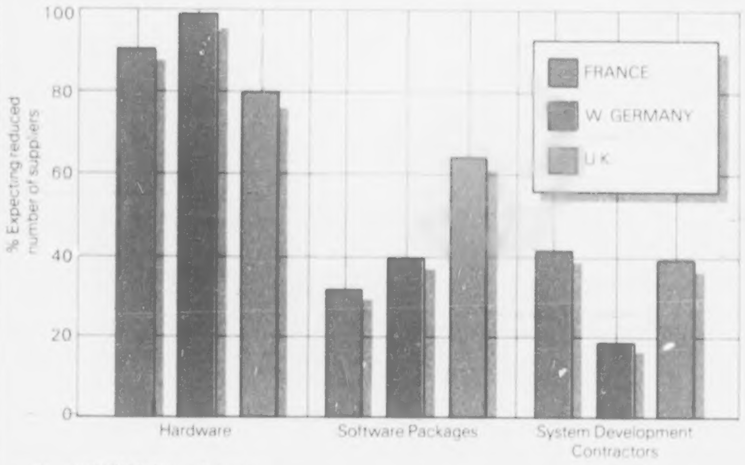
European users are most eager to embrace standards for operating systems as they revamp their IS strategies for 1992.

	Operating Systems	**Pack-ages**	**Database Systems**	**Software Dev. Tools**	**Suppliers**
(by percent)	%	%	%	%	%
FRANCE	72	72	28	50	56
GERMANY	100	13	67	27	7
U.K.	29	32	19	20	24

Source: DATAMATION/Price Waterhouse

Hardware Suppliers Face Shakeout

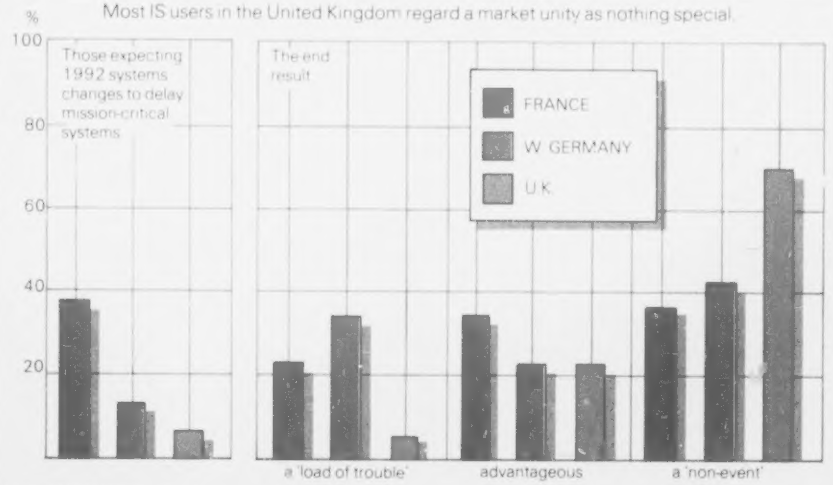
Most European users expect the number of systems suppliers to dwindle as 1992-inspired competition heats up.



Source: DATAMATION/Price Waterhouse

British Regard 1992 Cautiously

Most IS users in the United Kingdom regard a market unity as nothing special.



Source: DATAMATION/Price Waterhouse

Charts by Paragraphics

expect this to affect manufacturing, order processing, and distribution systems particularly."

Certainly users in all three countries expect European standards to influence their purchasing over the next four years. Operating systems purchases in particular will be affected. That's likely to have a shattering effect in West Germany, where all the respondents predicted standards would influence their OS buys. A high number of French users (79%) agreed, compared with only 29% in the U.K.

French companies also predict that their buying criteria for software packages and software development tools will be affected by 1992. West German firms say they intend to alter their database strategies, while British users expect less influence in most areas.

Networking Outward and Upward

Network expansion also seems to be an inevitable consequence of the move toward a united Europe. The single market, says one respondent, "will lead to more European links at the business level. IS will play an important part in providing the communications [infrastructure] for these links—electronic mail, electronic data interchange, etc. This will enhance the IS role in an organization."

That point was picked up by other users, too. The move toward a single market means that firms must prepare strategies to cope with the changes. Putting those strategies into practice presents "an opportunity for IS to become closer to the corporate strategy," says one British user.

Another British user takes the consequences of the process further, predicting that the single market will provide "an increased opportunity to push IS people higher up the company as it tries to deal with the business aspects of 1992."

Nevertheless, it will only be those IS executives who grasp the opportunities who are likely to benefit, and that's going to be tough for the British since a large proportion of U.K. users remain cynical about the impact of 1992. A strong majority simply regard it as a nonevent.

This attitude may change, though, as the pressures mount over the coming months. DATAMATION will be tracking the changes with its next 1992 survey, to be published this summer.

Europe's Electronic Trading Bloc

Network services and electronic document interchange systems are predicted to be the trading links that will tie Europe's single market together. Now, the task is to make it work.

BY PETER PURTON

1992: Trading Networks

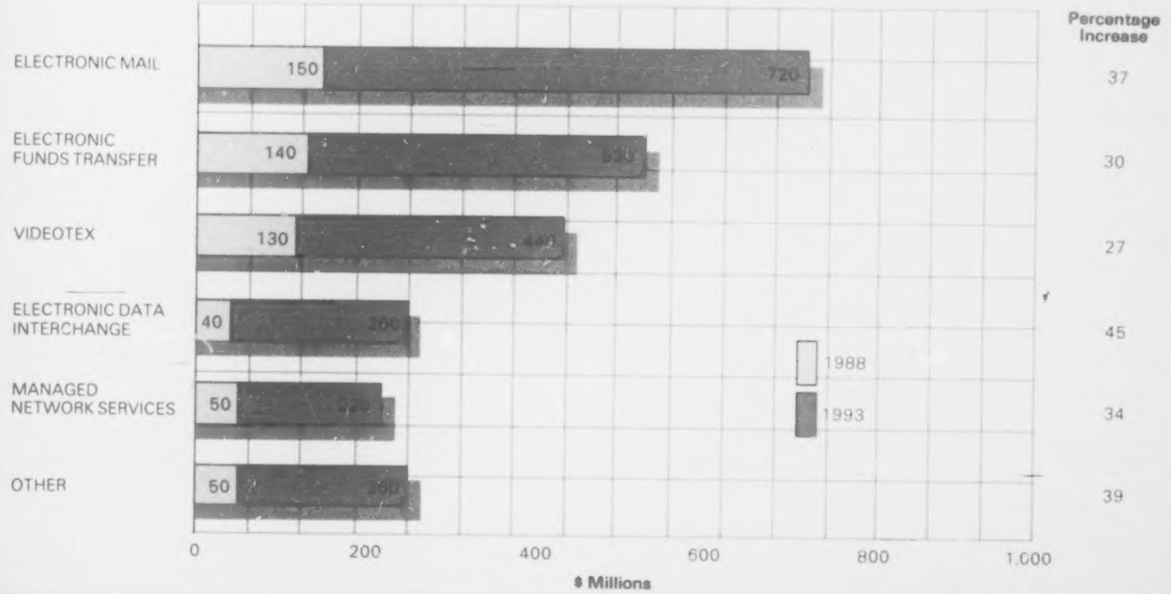
Jean Vinois, a member of the European Commission team in Brussels, declares of the implementation of its single market policy: "The single European market is all about the 12 member states working as one. Every procedure which improves business communications helps us attain the single European market. EDI will accelerate our attainment of the single European market."

EDI is really a form of electronic mail, albeit with a highly structured format. Experience with current e-mail systems suggests that an electronic message can save as much as half the costs of preparing and distributing an internal memo or external letter. Clem Jones, managing director of British Telecom's electronic messaging subsidiary Dialcom U.K. in London, estimates the savings due to EDI may be as much as $27 per transaction cycle, which is comprised of order, acknowledgment, delivery note, and invoice.

"In addition, and of greater importance to most firms," says Jones, "the time taken for the order-to-invoice cycle can be cut from around 14 days to 3 days, and this can generate significant savings in stock and improvements in cash flow." By implementing EDI, New York-based management firm Coopers & Lybrand thinks that industry could reduce the total cost of the

Mail and Money To Move Swiftly

Use of electronic mail and funds transfer will soar in Europe, as countries evolve a single market.



Source: Input Ltd

Chart by Catherine Francis

average product by between 5% and 7%.

The arguments for EDI are compelling and its rate of adoption reflects this. Traffic on the U.K.'s networks alone is estimated to be growing at 20% a month. The European Commission's target of seeing a giant EDI mesh covering all of Europe by 1992 is looking more and more achievable. But there are problems.

The first of these is that of standards. Mark Selsby, European EDI program manager at Digital Equipment Corp., estimates that there may be as many as 41 different groups working on EDI message sets in Europe alone. "The needs of somebody trading in high-volume consumer goods are completely different from someone else, let's say, engaged in international trade," notes Selsby.

Another obstacle to EDI's progress may be lack of security. "I cannot see EDI gaining significantly in popularity until the security problem is solved," notes Etienne Dreyfous, consultant to the international airline telecommunications network operator SITA and a pioneer of international data networking. "Business messages are inherently confidential. What company wants to give its competitors intimate insight into its relationships with its suppliers or customers?

Dreyfous believes that illegal access to corporate computers may pose an even greater deterrent to potential EDI users. "In this age of almost daily press reports of hackers and computer viruses gaining illicit access to computer systems, companies are getting very cautious about linking their computers to external systems," says Dreyfous.

Lack of Coordination

The major obstacle to EDI, however, may in the end turn out to be the same problem that the single European market initiative is designed to overcome—the divisions between the 12 member countries. As in so many other issues, the various European countries have adopted their own approaches to EDI without coordinating their activities with their neighbors.

"Some, such as the U.K., actively promote EDI and allow ease of export and import of electronic data," notes Peter Copping, executive director of telecom and computer at London-based PA Consulting Group. "Others, such as the Federal Republic of Germany, have sustained protectionist measures aimed at prohibiting foreign suppliers from gaining a dominant position in domestic markets."

There are also differing EDI standards. In West Germany Teletex—the super telex proposed and largely developed by the Deutsche Bundespost—has been heavily promoted as the means for exchanging electronic business correspondence. In the U.K., the so-called GTDI (guidelines for trade data interchange) syntax specification promoted by the Board for the Simplification of Trading Procedures (SITPRO), has been widely adopted.

In the rest of Europe, being able to start with a more or less clean slate, has brought the benefit of being able to go straight to EDIFACT (electronic data interchange for administration, commerce, and transport), the standard that is designed to eventually replace all of the existing standards.

Ironically, the signs are that far from protecting the home industries as they were designed to do, these protectionist strategies may have backfired. With just 1,000 or so users of EDI on the whole mainland of Europe—compared with over 6,000 in the U.S.—the European EDI industry has been all but throttled at birth.

☐ INDUSTRY COULD REDUCE THE TOTAL COST OF THE AVERAGE PRODUCT BY BETWEEN 5% AND 7%.

Even in the U.K., where government encouragement and a liberal environment has persuaded some 2,000 users to adopt EDI, the installed base of GTDI may make the U.K.'s EDI an island cut off in electronic trading terms from other European countries promoting EDIFACT.

The lack of agreement and coordination among these countries has opened the door to outsiders. The leading names in pan-European EDI in Europe are not European companies but U.S. companies such as General Electric Co. and Computer Sciences Corp.

As outsiders they have in fact enjoyed a number of advantages. For a start, by not being associated too strongly with any one European country they have managed to avoid getting entangled in the internal rivalry that is still a strong factor amongst the member states of the European Community. And by not being allowed to operate their own circuits, they have had to become experts at negotiating the obstacle course of cross-border telecommunications within Europe. Most important, their raison d'etre is to cater to their multinational clients—precisely those who are pioneering pan-European EDI.

A quick look at the major EDI projects in Europe today clearly shows the lead taken by the U.S. companies. General Electric supports what is probably Europe's most advanced EDI service—at least in terms of open standards—that of the Brussels-based European Council of Chemical Manufacturers' Federations. Relative newcomer to this field in Europe, Dallas-based Electronic Data Systems (EDS) is building a continentwide EDI network for its parent company General Motors, designed to link 2,000 computer systems in seven countries.

"Our estimates suggest that $200 dollars may be saved from the price of a car by using EDI," says John Wishney, head of development for EDS European Information Services, Reading, England. "Within 18 months we expect to have the majority of GM's regular suppliers dealing with [GM] electronically." Once the net is up and running, EDS hopes to sell capacity on it to other commercial users.

Europeans are beginning to hit back, however. Siemens AG, the West German electric and electronic giant, has set up Vascom, which will base EDI and other value-added network services on its own international network. That network boasts 400 nodes in 50 countries.

The PTTs, which probably hold the strongest card because they already have all of the customers and own the basic network infrastructure, are also gearing up to meet the EDI challenge. Last year, the Deutsche Bundespost and France Telecom announced the creation of their Eucom joint venture: EDI is expected to provide the core business. And last year, 22 of Europe's PTTs and network carriers, including the Deutsche Bundespost and France Telecom, agreed to form MDNS, a jointly owned venture with the aim of helping multinational companies and other international organizations meet their demands for cross-border network development.

So far in Europe there may be only a few thousand users, but any one of these users can have as many as 50,000 business contacts whom they are urging to also adopt EDI. Add this to the weight that the European Commission is putting behind EDI—in an effort to chip away at the estimated $300 billion spent annually on paper-based business communications—and it is clear that European EDI is on its way. ☐

Peter P[illegible] *is the editor of the* Telecomeurope Communications Newsletter. *He is based in Bath, England.*

Sector Performance Update: Food, Petroleum, Chemicals, and Pharmaceuticals

The message is mixed, but this won't necessarily be a boom year for companies in these industrial sectors.

BY MADELINE FRANCHI

In many cases, the food and beverage industry straddles categories: it's a processor on the one hand and a service sector on the other. On the process side, production rose about 3.5% in 1988 and will advance by just a little less this year. Compared with some other industries, this part of the food industry is less affected by the business cycle swings, since straitened consumers will spend an increased share of their income to cover their basic requirements.

The food service industry, however, is highly influenced by consumers' willingness to spend money on food away from home. It saw a surprising and steep downturn in activity during 1988. Retail sales at eating and drinking establishments grew about 6%, but that represented a real gain (adjusted for inflation) of only 1.7%. In real terms, we expect 1989 growth will just about equal that of 1988, but the trend will be up throughout most of the year, creating a notable difference in psychology for both the industry and the consumer. Expect sales at fast food places to outpace sales growth at full service restaurants.

The output of petroleum and coal products grew more slowly than expected late in 1988, ending the year with only a 2.2% increase. OPEC antics and forecasts of an economic downturn seem to have encouraged petroleum and coal processors to let inventories run low until they could form a better idea of the 1989 economic climate. Unless there are major surprises, U.S. petroleum production will inch downward 0.1% by the end of this year.

Thanks to favorable export markets and the restocking of some chemicals in short supply, the 1988 output of the chemicals industry grew 8.3% over 1987 levels. However, recent evidence suggests that chemical production will grow only very slightly this year because of reduced end-market activity, both foreign and domestic. Furthermore, higher prices will limit the amount of inventory manufacturers will carry as well as their willingness to enter into long-term supply contracts. In response to these forces, chemicals output will grow just 0.8% this year.

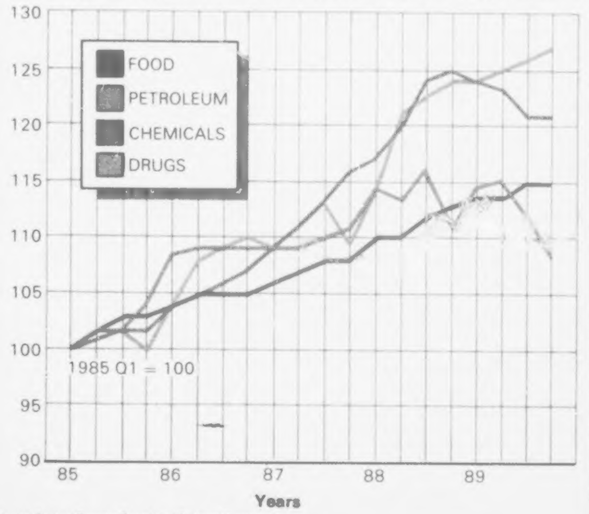
Within the chemicals industry, U.S. drug manufacturers in 1988 enjoyed their strongest year of output growth since 1976: production grew 9.7%, compared with an average increase of only 2.9% annually earlier in the decade. A significant part of this can be attributed to healthy gains in drug exports. After expanding 4.3% in 1987, exports of pharmaceutical preparations surged 26% in the first eight months of 1988 compared with the same period in 1987.

As a result of 1988's upturn in production, employment in the prescription drug industry made strong advances—the strongest, in fact, since 1977. Employment grew 6.6% to 181.5 thousand workers, 11.1 thousand more than in 1987.

With the dollar leveling off in 1989, the drug industry won't get the export boost that helped it last year. At the same time, U.S. consumers will not be able to pick up the slack as the economy enters its slowest growth phase since the 1982 recession. So production of drugs and medicines will rise a more moderate 3.5% in 1989.

Industrial Production Index

Drugs are up, petroleum is down, food and chemicals are flat.



Source: Federal Reserve Board and Cahners Economics

Sector Performance

A cooling economy may take the edge off results in these major industrial sectors during 1989.

	Estimated 1988	Projected 1989
Food and Beverage		
Production (1)	3.5%	3.2%
Full service restaurant sales (2)	$66.4	$70.3
Fast food sales (2)	$44.3	$45.3
Drinking place sales (2)	$9.7	$9.2
Petroleum		
Production (1)	2.2%	–0.1%
Avg. capacity utilization	84.8	84.0%
Plant/Equip. spending (3)	$19.4	$18.9
Chemicals		
Production (1)	8.3%	0.8%
Avg. capacity utilization	87.4%	85.3%
Plant/Equip. spending (3)	$19.7	$20.3
Pharmaceuticals		
Production (1)	9.7%	3.5%
Employment (4)	181.5	188.8

(1) Annual percentage change; (2) billions 1982 $; (3) billions $; (4) thousands of persons.

Source: DATAMATION/Price Waterhouse

Chart by Paragraphics

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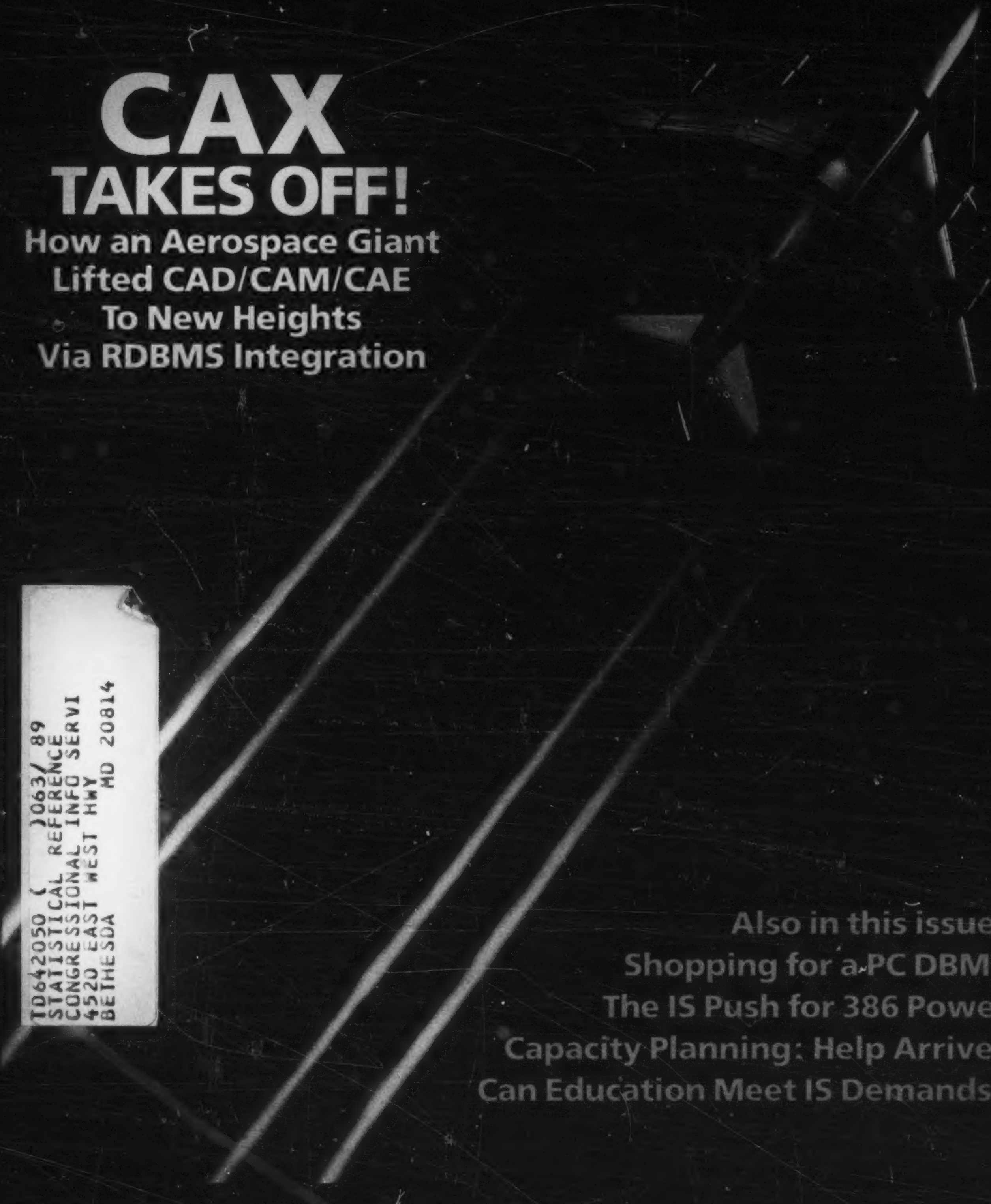

CAX TAKES OFF!

How an Aerospace Giant Lifted CAD/CAM/CAE To New Heights Via RDBMS Integration

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The IS Push for 386 Power

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Can Education Meet IS Demands?

MAR 15, 1989
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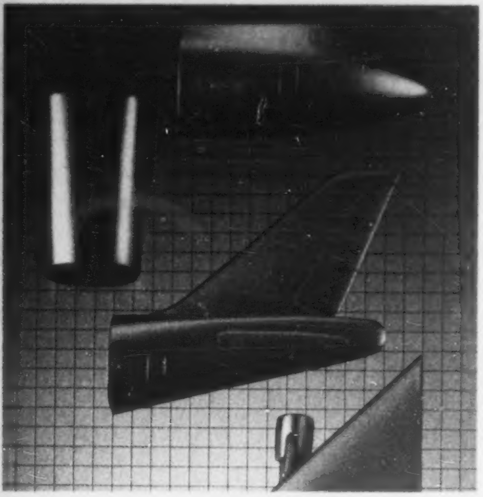

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BY ERNST GRILL, JOHANN FLITTNER, and WALTER RAUSCH In a report exclusive to DATAMATION, and published for the first time in English, a team from German aircraft giant Messerschmitt details how it integrated standalone CAD, CAM, and CAE systems via commercial RDBMSs. The integration reduces production costs and design time, improves the quality of manufacturing information, avoids multiple data inputs, and accelerates and controls the information flow from the design stage to final assembly.

Cover Photography by Walter Wick

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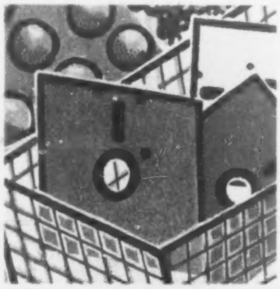

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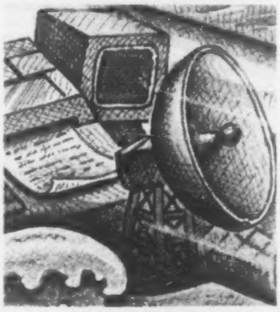

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BY MARVIN BRYAN Because they have grown in three major areas—power, ease of use, and connectivity—PC DBMSs are being used in applications formerly reserved for mini or mainframe-based software. It's estimated that sales of standalone PC DBMS products will have an 18% compound annual growth rate until at least 1992, and database products networked to DBMS servers will enjoy a 240% compound annual growth rate.

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BY BOB FRANCIS Departmental computing managers and other PC managers urge IS chiefs to resist buying low-priced but underpowered systems. Considering the next generation of power-hungry software, they insist 386-based PCs are the only profitable way to go. Systems employing the 32-bit chip can do practically anything: multitasking, networking, software engineering, accessing mainframes—you name it.

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BY MARVIN BRYAN As businesses invest more in business-critical applications, it becomes more imperative than ever to make sure they're getting the most from their IS investments. That's why they are calling on outside capacity planning consultants.

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BY SUSAN KERR Telecommunications is undergoing revolutionary change in the most prosperous Asian/Pacific countries. The result could be better service and more options for multinational users. Also included is an update on regulations and telecom practices in the most important Pacific Rim markets and destinations.

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BY LEILA DAVIS Many in education and in the IS industry are concerned about the quality of education in U.S. schools and are pushing reform, but meanwhile alternatives are proving effective.

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EDITED BY WILLIE SCHATZ A report on products, services, and methodologies for IS managers in government, whether federal, state, or local. Future editions will serve managers in the financial services and manufacturing sectors. (Not included in all issues.)

The Rewards of Honest IS Effort

In our effort to digest all of the management-made-easy nostrums and isn't-it-wonderful technologies handed us these days, sometimes we forget a simple truth about corporate and human endeavors: Perseverance, combined with intellect, yields successful results.

If you don't believe it, just ask West German aircraft maker Messerschmitt-Bölkow-Blohm or DATAMATION editor Marsha Fisher.

The company is the subject and the source of this issue's cover report, "A CAX Success Story," p. 16, which details how a Messerschmitt IS manager and two colleagues have achieved a modern age triumph in systems integration. Fisher, who first alerted us to the importance of the development, spent weeks managing the story through a rigorous editing process, which entailed countless hours of phone work, faxes, and an occasional run to a German-English dictionary.

What caught Fisher's trained eye in a manuscript submitted by Ernst Grill, Johann Flittner, and Walter Rausch was the team's practical yet derring-do approach taken toward solving an IS problem that's on every manufacturer's technology wish list—integrating all the functional disciplines required in producing a product. The team used commercially available database management software to link its standalone Catia CAD system to its DB2 database—in the first step toward forging an integrated CAD/CAE/CAM database solution.

"It was refreshing to see innovation coming from a user site instead of the normal source, vendors," says Fisher, who edits articles for our Systems and Management sections. "The fact that somebody had actually figured out a way to integrate graphics data and alphanumeric data struck me as novel, one with broader implications for our readers than just a factory application."

Photograph by Steve Borns

MARSHA FISHER, DATAMATION editor

Equally impressive was the weight and quality of documentation supplied by the authors, indicating the extent of their testing. "The clincher," Fisher recalls, "was discovering that the application was in production. It wasn't just another off-budget, behind-the-scenes IS experiment."

The aim of Grill and colleagues, of course, isn't merely to show that such integration is achievable. What they're after is to make Messerschmitt a stronger competitor in the world aircraft market. They measure their success not in throughput or access times, but by meeting tangible business objectives like reduced production costs and design cycles.

U.S., Japanese, and European manufacturers would be wise to persevere in their struggle to shape IS to serve their business needs with as much vigor as the Messerschmitt team.

Pushing the PC Envelope

Engineers and plant managers, however, have hardly cornered the market on making productivity gains through innovative use of technology. As Dallas Bureau Manager Bob Francis discovers in the "The IS Push for 386 Power," p. 39, and contributor Marvin Bryan observes in "Shopping for a PC DBMS," p. 25, PC managers and power users are pressing the IS execs who support them to invest in robust desktop solutions. The reward for buying into 386-based systems and SQL-supporting PC database software, they promise, is improved worker performance. We hope they persevere.

Tim Mead

—Tim Mead, Editor-in-Chief

DATAMATION

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Can Education Meet IS Career Demands?

Many in education and in the IS industry are concerned about the quality of education in U.S. schools and are pushing reform, but meanwhile alternatives are proving effective.

BY LEILA DAVIS

NSBA'S MECKLENBURGER wants to apply technology to all phases of education.

Photograph by Katherine Lambert

George Bush proclaimed East Los Angeles high school calculus teacher Jaime Escalante as one of his heroes during last fall's campaign debates. Now that Bush has been inaugurated, however, members of the technology and education communities are waiting to see if the new president will "Stand and Deliver" on promises to support educational reform.

Both information industry executives concerned about the quality of future job applicants and education specialists watching a snowballing reform movement say that Bush could provide the kind of leadership role needed to assure improved individual and economic growth into the next century.

Armed with fresh evidence that technology can improve the learning process, the two groups are watching closely for signs that the new administration will make good its promises to pick up the torch.

"Our ability to compete as a nation is in serious trouble. It is very clear that America is nowhere near as literate as the countries with which it is competing," says John Clendenin, chairman of Bell South.

"Is there time to make changes before we as a nation are dragged down? Yes, if the leadership in Washington focuses attention on the problem. Bush can underscore the urgency for reform—and I think he will," Clendenin predicts.

Clendenin's Atlanta neighbor, Management Sciences America (MSA) chairman John Imlay, concurs. "The biggest limiting factor in our industry's growth today is the ability to find good people," asserts Imlay. Given the more progressive educational programs of other countries, "even India could surpass us unless we get these kids heading our way." Imlay is a member of DATAMATION's Advisory Board.

Although Bush emphasized education during his campaign, he apparently has had little time to study the issues of declining math and science literacy and lack of computer skills. At press time a spokesman for the Bush transition team could only say that "George Bush is definitely interested in bettering education, but we haven't gotten policymaking down to the specifics yet."

THE BUSH YEARS
This is the second in a series of articles on IS under the new administration.

But administration watchers say that there are positive indications that appointees to the new Cabinet are keenly aware of the problem. The President's Chief of Staff, former New Hampshire governor John Sununu, gave active support to the increased use of technology to improve schools in his home state, and has addressed various information industry conferences on the subject.

Sununu declined to comment, but those in the education community say his record in New Hampshire speaks well for him. "Governor Sununu has been very good in his state. He's a zealot for video and telecommunications technologies and for giving computers to teachers," says James Mecklenburger, director of the National School Board Association's Institute for the Transfer of Technology to Education.

"It would be a leadership act among wise leaders to urge technology use in the schools," Mecklenburger adds.

Secretary of Education Lauro F. Cavazos, who came to the department last September from Texas Tech University, demonstrated his awareness of the problem in a speech last December. Quoting the "Nation's Report Card" to a meeting of the Council of Scientific Society Presidents, Cavazos noted that only half of high school juniors "appear to know enough about science 'to perform jobs that require technical skills or to benefit substantially from specialized on-the-job training.' "

Five Key Problems Identified

Cavazos attributes the problems in education to five factors: lack of time devoted to science; poorly organized math curricula; poor quality of instruction; a dearth of good textbooks; and insufficient teacher training.

While these problems have been identified by the Secretary and others, the extent to which they affect IS organizations of U.S. companies is harder to measure. Members of the IS community are less concerned over the drop in enrollment of computer science majors in colleges than with problems in basic skills. They are already looking to CASE and other software productivity tools to pick up the slack they see coming in a less technical work force.

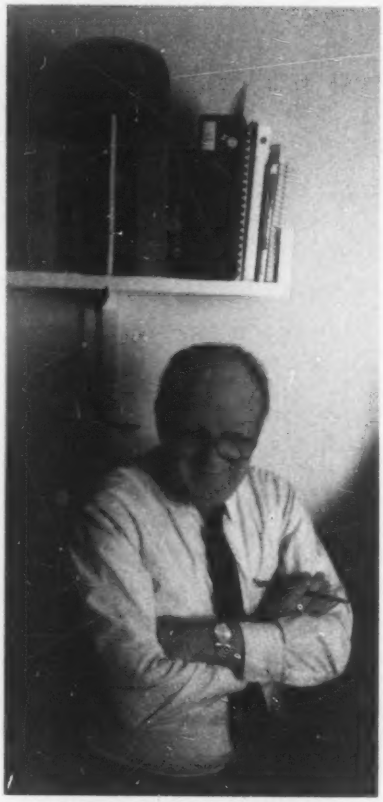
"What we are looking for are good fundamental skills—reading, writing, analytical skills," says Chester Delaney, vice president and manager of systems human resources for Chase Manhattan Bank in New York. "We don't expect schools to turn out people to handle computers in the way we require. We can teach them that.

"Our business is basically people. Communications and management skills are what make a computer department work well within a company," he adds.

"You can teach technical skills, but it is tougher for companies to teach communication skills," notes Michael Ettinger, a corporate personnel representative for the Mervyn's department store chain, based in Hayward, Calif. Ettinger recruits exclusively for the MIS department that supports Mervyn's chain of more than 200 stores in 15 states.

"We expect that CASE software and other innovations will help less technical people generate their own programs," says Ettinger. "We assume we will have fewer programmers sitting at terminals for hours a day."

Nick Simonds, executive director of MIS at Chrysler Corp., also sees more emphasis on productivity tools. "We will have to use the technology itself to help us do more with less. It won't solve the problem, but it will help. The traditional market in which you could say, 'We need another 100 people,' won't exist. Even if you could afford to hire another 100 people, you wouldn't find 100 qualified," says Simonds.



Photograph by Steven Borns

BANKER DELANEY is looking for fundamental skills—reading, writing, analytical skills.

"As the baby boomers age and begin to retire, we will have to translate more knowledge onto expert systems," he explains. "We have begun to take some of our standard processes and embed them in computer code. That will allow us to work with a more unskilled work force. We will still need people to adapt those processes to new circumstances, so the company will have to do a big part of their training."

IS directors report concern over poor teacher training, a national lack of emphasis on math and science, and a disinterest on the part of educators to prepare students for the business world. "I think the drop in computer science enrollment is because the computer science curriculum hasn't been as supportive of the business side as it should be," says Delaney.

"I never find any computer science majors who have studied COBOL. Instead they learn computer architectures, compiler design. The schools can't equip a student to walk into our jobs and know our computers and our software, but there are things that they need to know and [they] don't," he says.

Maintenance Disenchantment

Those dwindling computer science majors entering the work force are more likely to go after a job at a vendor firm than to seek work within the IS community, many executives note. The first assignment for an entry-level programmer or programmer/analyst is generally to maintain existing software, which is not exciting enough for many new graduates. They would prefer to go into systems development for a vendor.

"Computer science majors are at the exotic end of the spectrum. They want to do more sophisticated things. Those people are not interested in an IS department's entry-level job," says Delaney.

Carl Reynolds, staff vice president at Hughes Aircraft, echoed Delaney's observations. "People want to start higher up. They don't want to do basic maintenance programming, they want to do new things. Very few of my programmers are working on things that would interest a computer scientist. Our work has more to do with managing information systems," says Reynolds.

As a result, IS directors say that they expect to hire fewer and fewer entry-level applicants with technical degrees. More candidates will have to come from the schools of business and liberal arts, where recruiters will have a larger pool from which to choose.

"A lot of kids will be coming out of college with nontechnical degrees, and won't have good avenues to get into business. The science disciplines will be screaming for people, and will have to recruit them," predicts Simonds at Chrysler.

"We are going after the business degree with a computer science minor, if we can get it," says Mervyn's Ettinger. "Business skills are more important than technical skills, which we can teach ourselves. We only require that candidates have one COBOL course. Then we put them through a six-week training course, and they receive additional training as their job requires it," explains Ettinger.

While many in the IS community express concern about problems in basic education, the need for reform, and better exposure to computers in schools, virtually all of the executives emphasized another point regarding fresh recruits: "No matter how qualified they are," says Delaney, "there will be fewer of them."

With the end of the baby boom generation now in its late twenties, the students currently in high school and college are members of the "birth dearth" generation—the population dip that ensued after the baby boom. IS directors see the shrinking number of entry-level candidates in general as compounding the problems of education.

According to Chrysler's Simonds, however, when members of the current smaller baby boom begin graduating from college, the ratio of those going into the sciences will still never match the numbers attracted to technical careers over the past 20 years. "It all went up so fast—the industry bloomed, the baby boomers hit the work force, women emerged as a major part of the work force. Things will not happen like that again."

New Approach Proposed

Such demographic trends may be hard to predict, but the nation's educators, meanwhile, are pushing reform. Martha Stone Wiske, codirector of the Educational Technology Center at the Harvard Graduate School of Education, describes the reform that many educators are rooting for. "We must move from the transmission approach, in which the knowledge is transmitted from teacher to student, to more of an inquiry approach, in which the teacher and student work together toward the construction of knowledge.

"Learning theorists have proven that memorization doesn't work. Students must be learning how to think for themselves, to appreciate how math and science knowledge is made," she adds. "They need to know how to do critical thinking, to know the process by which mathematicians and scientists reach their conclusions. Computers can play a big role in this guided inquiry approach."

Mecklenburger at NSBA emphasizes the need to apply technology to all phases of education. "In a general sense, few if any educational objectives we have can be accomplished without technology. School administration can't improve without technology. The curriculum cannot be made better without technology. The performance of teachers and the streamlining of their workload cannot take place without technology. Student learning cannot be made more efficient without technology," says Mecklenburger.

In his speech, Cavazos said he intends to discuss these issues with governors and educators in coming months, and he also called on business groups to get involved. Cavazos cited the success of programs like the Industry Initiatives for Science and Math Education at Lawrence Hall at the University of California at Berkeley, where teachers are hired by businesses to conduct research during the summer. The stint sends them back to the classroom with "real world" experience.

Industry executives are making moves on their own, too. Within the last year, many of the information industry's leaders have become education activists. Industry firms and associations are jumping in with a patchwork of programs and services designed to help schools and students at the local level.

"Two years ago, business people would look at students and say, 'Isn't that a shame,' but not do anything. Today, they realize that those kids are the ones that will be in our work force tomorrow. There is a widespread recognition within the business community that we must help engender public concern for better education," says David J. Barram, vice president of corporate affairs at Apple Computer in Cupertino, Calif. While Apple remains the leader in selling computers to the education community, Barram is active within the company in organizing volunteer and support programs for local school districts.

Unprecedented Involvement

Technology firms are becoming involved in the public education system in unprecedented ways—lending employees as teachers, giving speeches and leading career discussions in high schools, making vacant seats in vendor training courses available to teachers, and providing local political support to school administrators seeking reform.

Leaders in both communities see this new partnership as a positive step, but say they still need federal leadership in setting priorities, funding research and development, and assuring equity of access to education reforms.

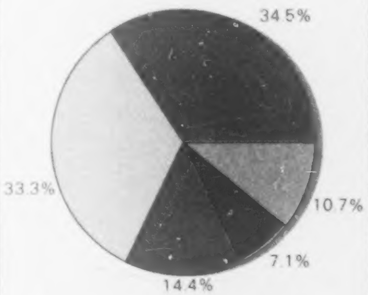
Equity is an issue that surfaces frequently in discussions on education technology, since current studies show that schools in more affluent, predominantly white neighborhoods generally have more technology and are further along in educational reform than poor rural and inner-city schools. "There are some islands of excellence," says NSBA's Mecklenburger, "but we need a nation of

☐ COMMUNICATIONS AND MANAGEMENT SKILLS MAKE AN IS DEPARTMENT WORK.

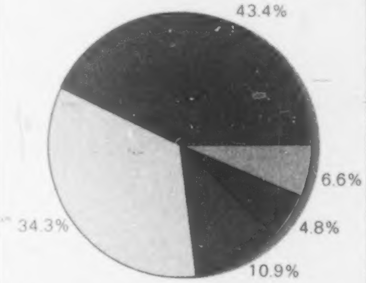
How Many Hands on the Keyboard?

In almost two-thirds of U.S. elementary schools, each computer must serve more than 30 students.

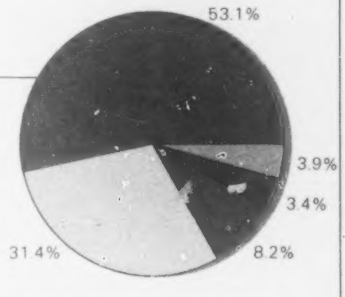
Distribution of Computers in U.S. Public Schools, 1988



Elementary schools with computers



Junior high schools with computers



High schools with computers

Students per computer

▨ 1-29 ☐ 30-59 ■ 60-89
■ 90-119 ▨ 120+

SOURCE: Office of Technology Assessment, based on data from Quality Education Data Inc., 1988

Chart by Catherine Francis

excellence."

Clendenin of Bell South calls for Washington to "set a leadership stance to focus attention on the problem. Ultimately, it has to be fixed at the local level, because the bulk of the funding is local and state. But Washington can do a lot to set the tone and I hope they do. I hope the urgency of the message comes out loud and clear."

Battling Birth Dearth

Through the year 2000, the most rapidly growing of all U.S. industries in terms of employment will be computer and data processing services, according to a 1988 report from the Bureau of Labor Statistics entitled "Workforce 2000."

Employment in the computer and IS services industry is projected to grow at a rate of 5.2% per year, which will just about double its 1986 level to reach 1.2 million by the year 2000. "The need for systems design and analysis, programming, and software development is certain to be very strong," predicts the BLS report.

However, the economic and employment projections, prepared biennially by the Bureau, also show a slowdown in the growth of the nation's labor force. It is expected to expand to 21 million, an 18% growth rate, by the year 2000. The growth rate from 1972 to 1986 was 35%.

For fast-growing information industry employers, the difficulties of a slowing labor force will be compounded by the prediction that most of the new human resource pool will come from population segments that have statistically lower levels of preparation for careers in high technology: blacks, Hispanics, and women.

Minorities will account for 57% of labor force growth; if non-Hispanic white women are included, that figure exceeds 90%.

The report points out a large disparity in the current occupations of these minorities and the projected growth areas for occupational employment.

The potential for a poorly qualified labor force won't be restricted to the information services sector, according to Workforce 2000. Although employment in the computer manufacturing segment is expected to level off in coming years, the BLS report points out that unlike other manufacturing industries, computer manufacturing requires a relatively low percentage of production workers. More than 25% of employment in this sector consists of engineers, technicians, and systems analysts, while production workers represent only 35%. In manufacturing as a whole, production workers represent 68% of employment.

"Policymaking will need to focus on ensuring that all youth, particularly minorities, are given sufficient education to ease their entry into the job market and equip them with the skills needed to advance to better jobs," says the report. "While education alone is not the solution to all labor market problems, it is clearly important in the solution."

Industry and occupational data from the Workforce 2000 report are available on tape or diskette from the Bureau of Labor Statistics, Div. of Financial Planning and Management, Rm. 1077, 441 G St. N.W., Washington, DC 20212. The report can be ordered from the Government Printing Office by calling (202) 783-3238.

"The federal government can help, and the major thing it can provide is the right climate," agrees Bob Berland, vice president, vendor strategy and support, at IBM's Applications Systems division. Berland is very active in ADAPSO's (the Computer Software and Services Industry Association) Success 2000 project launched this year, which encourages executives to get involved in schools by giving talks, making video and slide presentations to high school students, and offering help to school administrators.

"I got involved with the ADAPSO program because I was concerned by the tremendous drop-off in computer science majors and by the lack of math and science proficiency in general," says Berland. "I read in the Workforce 2000 study [see "Battling Birth Dearth"] that the U.S. is 12th or last [in a survey of high school students in the 13 most developed countries] in every single category.

"As an American, an IBMer, and a parent, it scared the hell out of me. I recommended at an ADAPSO meeting that we do something to let kids in school know how exciting our industry is," Berland explains.

ADAPSO's program, launched in 1988, so far has concentrated on motivating students to study for a career in computer software and services rather than addressing the curriculum or computer literacy issues directly. The trade organization has had a tremendous response from its membership to create a speakers bureau for schools. It has also produced a video featuring Microsoft's Bill Gates, IBM's John Akers, Jim Manzi of Lotus, Apple chief John Sculley, and Ken Olsen of DEC in discussions about industry career options.

ADAPSO's Grass-Roots Approach

Top executives from the biggest to the smallest technology services companies are responding to ADAPSO's call. "At IBM, we focus not just on the kids but on the teachers, too," says Berland. "For example, IBM has all sorts of classes going on all the time. We offer teachers the chance to attend some of these classes."

The ADAPSO Success 2000 volunteers and others in the industry stress the need for a grass-roots approach, since the public education system is administered at the local level. The federal government can and should launch an awareness campaign, and additional federal funding couldn't hurt, say industry executives, but the bottom line is the local school district.

Apple's Barram emphasizes the need for political support. "Business people are making a lot of noise at the federal level, but the real contribution is at the local level. Businesses should understand what the school is trying to do, offer constructive criticism, and help in the political process of getting it done.

☐ "THERE ARE SOME ISLANDS OF EXCELLENCE, BUT WE NEED A NATION OF EXCELLENCE."

"All the other programs are terrific, but if we could work together to build a political consensus, we'd dramatically change the political landscape of America," admonishes Barram. Apple advises schools to call the most important businesses in the area and ask them for help to support their political agenda "because it is where their workers will come from, and where their kids go to school."

Some in the education community, accustomed to finding resources where none are apparent, say funding is not the primary issue. Says the NSBA's Mecklenburger, "Vision, leadership, and financing, in that order, are what's needed." ☐

Leila Davis is a freelance writer based in Alexandria, Va.

GOVERNMENT

SECTORS

SCAN

The Extremely Long Arm of the Law

NEW YORK TAX SYSTEM GOES EVERYWHERE
$50 MILLION COLLECTED IN FIRST TRY.

When each of New York State's Tax Department's computers was an island unto itself, it was easy to tell a lie and get away with it.

Now, under a plan administered by James W. Wetzler, the Commissioner of The New York State Department of Tax and Finance, computers talk to each other, and they have no secrets. Neither do New York State tax evaders.

New York's chief tax man James W. Wetzler

"We told the programmers to pretend they were tax cheats and to try to catch themselves," says Paul Rickard, a spokesman for the tax department. "So they did. And they rarely missed."

An investigation into wealthy taxpayers claiming not to be New York residents uncovered $50 million in unpaid taxes from the first 12 people audited. Not a bad ROI for a six-year, $65 million computer modernization of N.Y.'s department of Taxation and Finance.

Under the old regime, the computers had a serious failure to communicate. A Sperry 1192 mainframe supported three incompatible systems that didn't have a prayer of talking to each other. Then what should appear but an IBM 3090-400E supercomputer, which now runs in parallel with the 1192. The 3090 supports 2,400 terminals; the 1192 supports 1,000.

"We went top drawer on this one," Rickard says.

The 12 people who thought they were home free could have told him that.

LOOKING FOR A JOB?

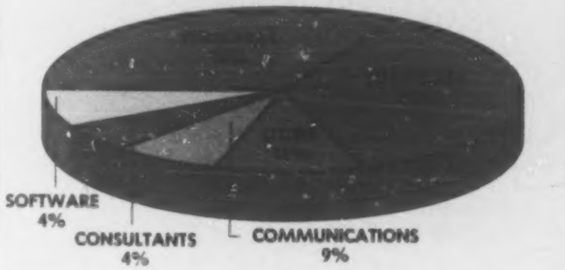
Local governments are hiring more IS talent than organizations within their state and federal counterparts.

	Average Number of IS Employees		
Organization	**1988**	**1989**	**Change**
Local municipalities	21.0	23.2	10%
State agencies	27.4	28.6	4%
Federal government	74.7	75.3	1%

Source: DATAMATION 1988/1989 Budget Survey

STATE EDP SPENDING IN 1988

People and hardware consume most of the money.



Source: National Association for State Information Systems

Network via Bulletin Board

The PC bulletin board offered to city government officials as part of a four-month-old network called Local Exchange is not for hackers only. It offers information and services to local government employees at all levels of computer literacy.

Local Exchange was created by Washington, D.C.-based Public Technology Inc., the National League of Cities, the International City Management Association, and the Government Finance Officers Association to provide electronic mail, bulletin boards, databases, computer conferencing, and other electronic services over the Telenet network.

The network organizes its more technically oriented users into groups that can share solutions to PC problems in government applications. It also offers a database on innovations in local government and an abstracting service for over 400 periodicals that address local government concerns.

"The service is pulling local governments together and bringing specialized information to them," says Ted Shogry, Local Exchange's project leader and Public Technology's center director for network services.

"An audience like this is hard to address because it is international, has a geographically dispersed membership, and a range of computer skills within that membership," Shogry adds.

Local Exchange has several hundred subscribers right now, according to Shogry, who hopes to see that number grow to several thousand across the United States and Canada. He would only describe the subscription and connection charges as "modest."

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Editor: Willie Schatz

Managing the Debt

With larger investors pulling out of the bond market in search of higher margins elsewhere, city financial officers have lost the management and analysis services that frequently accompanied the underwriting of a bond issue. Meanwhile, juggling new types of debt—certificates of participation, installment debt—demanded more sophisticated controls than paper, pencil, and an off-the-shelf spreadsheet package.

"The problem was, there was no PC software out there to help us do that," recalls Andy Atkinson, the finance director for New Hanover County in North Carolina. "We couldn't find anything to help us keep track of our payments. We would have to generate a payment schedule on paper, and check off each time a payment was made. At the year-end, we'd put it all into Lotus [1-2-3] and create a financial statement. If we had to go back into the bond market once or twice during that year, we'd have to regenerate the payment schedules to analyze each issue."

Larry Blanton

Atkinson now uses a package called debtBASE from Carolina Software that allows him to produce an annual statement—which used to take one week, minimum—in a matter of keystrokes. It also has saved him auditor costs, since the payment history of each issue is maintained on his PC and reconciled with the previous year's debt.

"There were packages on the market that did what I wanted, but they were very expensive—$5,000 or more—and really would have been overkill. Most of these started as mini or mainframe software that was downsized for PCs," explains Atkinson.

So Atkinson looked around at the alternatives and eventually picked Carolina Software of Wilmington, N.C. He chose Carolina because the firm's founder, Larry Blanton, had been deputy finance director for the City of Wilmington, and his firm had already begun to profit from the dearth of specialized software for city governments.

"DebtBASE provides primary tracking of all debt issues and summary information on what was borrowed, from whom, what the rate was—it can also handle flexible rates. It shows the payment schedule and provides a spreadsheet to post the payments as they are made and the debt of principal or interest payments remaining," says Carolina's senior systems analyst Ginny Caughey.

The Government Finance Officers Association in Washington, D.C. recognized the burgeoning need and market potential for capital finance software, and has been offering to its members a number of programs developed by various vendors.

The International City Management Association got in on the act two years ago, when its general membership hotline began to clog with inquiries about software packages for various city management functions. It decided to publish a software reference guide for city government officials.

"The first one was a very small listing," says the ICMA Software Reference Guide's assistant editor, Milou Carolan. "But the 1988 edition was considerably larger, and this year we have 625 programs from over 300 vendors."

The 1989 edition will cost $40, and will be available soon from ICMA, 1120 G St., Washington, DC 20005.

LAN Shopping Made Easy

The urgent demand for local area networks by government agencies has prompted the General Services Administration's Office of Technical Assistance to create a multiple awards program that will ease the procurement logjam for LAN-shopping agencies that are clients of OTA.

Howard Grandier

"Local area networks are still the hottest growing area among federal agencies, with no let-up in sight for the next two to three years," says Howard Grandier, director of software development and information technology at OTA. "The procurement process is typically long, involved, dangerous," he adds, explaining that an agency acting on its own could spend up to a year to evaluate and buy a LAN.

"So we invented a unique program—we award a number of indefinite awards to various vendors, to be specified later for particular agency applications. Basically, we prequalify the vendor for the agencies."

The first five-year contract awards are expected to be made soon. There is no predetermined number of qualifiers. The vendors are scored on various aspects of their proposals, and OTA establishes a competitive range based on the scores tallied. The vendors within that competitive range are accepted. The program will be opened again for competition once a year, but new applicants will be judged against the existing competitive range.

"We've had a program like this for general OA systems, but LANs have become so big that they warranted a separate program," Grandier notes. When an agency comes to OTA for its consulting and support services, OTA will be able to hold a competition among the prequalified vendors for the specific LAN project and make an award within 10 weeks. "The agencies get a competitive procurement, they get companies with a good track record, and they cut their procurement cycle by one-third."

The typical LAN installation right now is within a department or a single building. Although some far-flung agencies like the Social Security Administration have begun tying together all their offices through wide area networks, most agencies are still trying to round up standalone PCs used by 100 to 150 people. "Once an agency gets several LANs installed, someone at the top will say, 'Let's tie all these LANs together.' Then LAN growth will slow down and we'll be on to the next step: WANs," says Grandier.

YOUR TAX DOLLARS AT (NET)WORK

U.S. agencies spend more on LANs as a portion of their IS budgets than other public institutions or private industry.

User	IS Budget on LANs
Federal government	4.6%
States	.2%
Municipalities	.6%
Manufacturers	1.6%
Service Companies	1.4%

Source: DATAMATION 1988/1989 Budget Survey

Will You Test Negative For Posix?

The National Institute of Standards and Technology (NIST) is looking for beta test sites to test conformance to the proposed revision to its new Posix Federal Information Processing Standard (FIPS 151).

If implemented, the revision will bring the Posix FIPS in line with the IEEE's final version of Posix released late in 1988. The original Posix FIPS was based on an earlier draft of the IEEE standard (see "Federal Info Managers Embrace Stopgap Posix Standard," Oct. 15, 1988 p. 19).

The test suite software being offered for beta testing contains a list of test assertions to which a product must conform to meet the final Posix standard. The software takes the product or system through each syntax on a one-to-one basis and tells what each syntax must do to conform, according to Jim Hall, a computer specialist at NIST.

Federal agencies in the midst of a large Posix procurement and Posix product vendors are the candidates most likely to apply. The cost is $100 to cover handling of the tape. A test site must agree to respond promptly to NIST with any problems with the conformance software. In its final version, the test suite will cost $2,500.

The official closing date for applications is next February, depending on its publication in the Federal Register. NIST probably would not turn away anyone applying late, however. "We aren't restricting anyone," Hall says. "We're hoping for 30 applicants, but we'd like to have more."

Munis Ease Buying Bonds

The Municipal Securities Rate Board soon will begin working on a central repository for the annual statements of all 8,500 to 10,000 municipal bond issues released in the U.S. each year. The repository would store the statements on optical disk and offer them on-line to investors.

The MSRB is waiting for word from the Securities and Exchange Commission to proceed with the project. The SEC had proposed that municipal bond underwriters take certain steps to review the annual statements and make them available throughout the life of the bond issue.

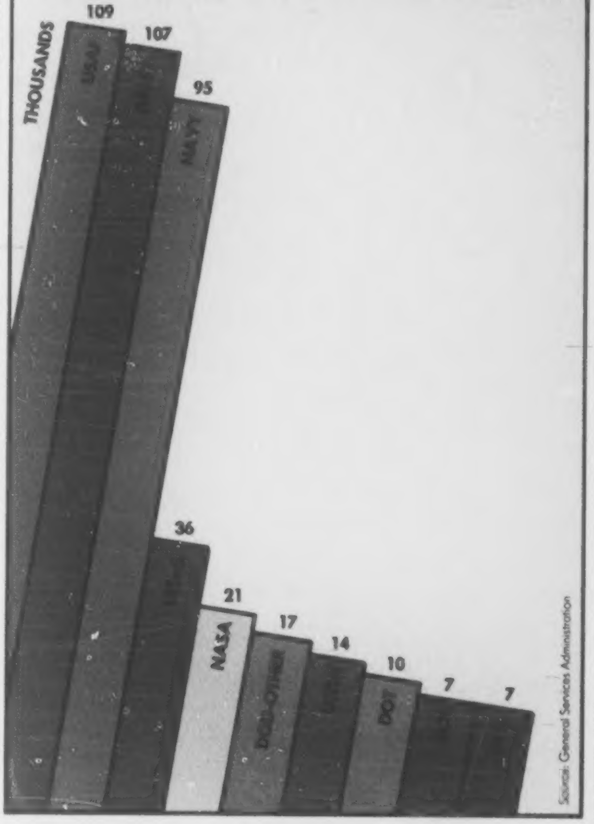
"The board has been looking at various technologies to use in a central repository," says MSRB executive director Christopher Taylor. "We've decided that optical scanning makes the most sense."

Filing annual bond issue statements electronically would mean setting standards, which presents big political problems. Comments to the SEC from local goverments show they fear that standards would mean a loss of control.

The board won't move on the repository until the SEC makes central filing of the statements mandatory. "We want to make sure we can get all of them, and get them on a timely basis," says Taylor. ◀

MICROCOMPUTERS BY TOP 10 AGENCIES

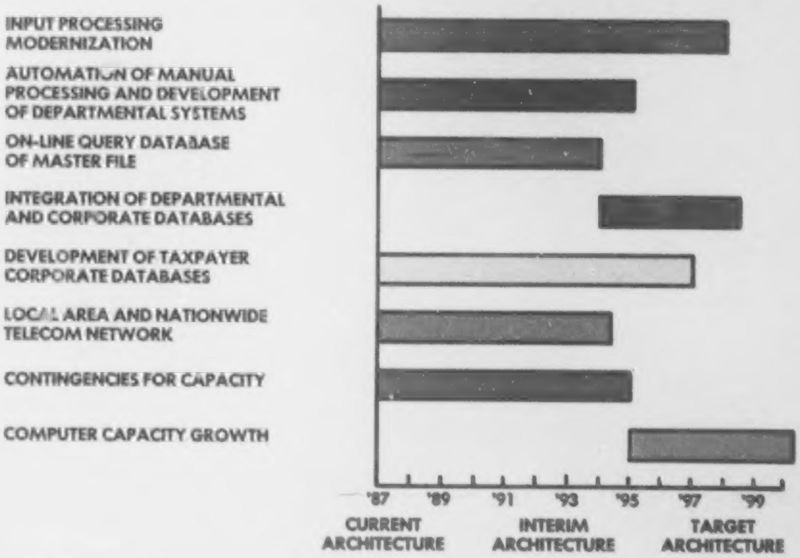
Defense agencies take the lion's share of microcomputers.



Source: General Services Administration

IRS TAX SYSTEM REDESIGN

This proposed timeline charts the schedule of technical enhancements to the IRS system.



Source: Briefing Report to Congress

4/4/89 C1850-5A

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INTERNATIONAL EDITION/APRIL 1, 1989

Introducing TECHNOLOGY FORUM: Software Development

DATAMATION®

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

IS Budget Growth Slides

Spending on systems and staff grows slightly as users streamline their IS strategies

Also in this issue:

IBM's Fixed Price Service Pitch

How To Hire the Right Programmer

Phone Mail Gets Stamp of Approval

APR 1, 1989
VOLUME 35
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DATAMATION®

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

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The Importance of Research

Research has been a hallmark of DATAMATION almost from its inception in 1957. Through the years the magazine has tracked the growth of the worldwide information technology industry in various ways—measuring the revenues of the top 100 IT suppliers, gauging salaries of IS professionals, partnering with Cowen & Co. to track PC, minicomputer, and large-scale systems sales, among other things. Perhaps no single research effort is more important, however, than our annual IS budget survey. It tells you how much your peers are spending on hardware, software, services, and personnel—important knowledge to have in these competitive times, when IS outlays for equipment constitute nearly half of all business investment. This year's analysis, "IS Budget Growth Drops," begins on p. 18.

That the growth of IS spending has slowed in the U.S. will hardly surprise anybody. Users polled by DATAMATION indicate they'll only invest 4.4% more in their IS operations this year than they did last year, when IS outlays increased by nearly 8%. But don't dismay, says Parker Hodges, who collaborated with DATAMATION research manager Laraine Donisi in preparing this year's survey. "Despite the downward trend, it seems to me that people are getting a lot more bang for the bucks they're forking over for systems and networks," Hodges says, noting that users expect their IS investments to yield a 36% increase in processing power for their organizations in 1989.

Photograph by Steve Borns

NUMBER CRUNCHERS Hodges and Donisi tote results.

"The most interesting thing we did in this year's study," explains Hodges, as he looks over four tomes of budget numbers, "was to ask the questions in a way that would yield information our readers could use on a truly competitive basis." For the first time, the seven-year DATAMATION veteran points out, the research team went to the effort of categorizing results for three different sectors of the economy: manufacturing, services, and public. This analysis gives users a clearer picture of IS spending trends than in the past. "A couple of years ago," Hodges recalls, "I got a call from an IS exec on Wall Street who thought his head count was too high because it was well over the mean for personnel outlays. When I explained to him that government hiring practices tended to skew this number downward, he was relieved. I don't expect to hear from him this year."

A Forum for Technology of Significance

Research of another kind also has distinguished DATAMATION for more than three decades. The publication, originally a spin-off of *Research & Development* magazine, has long enjoyed a reputation as the preeminent place for industry experts to publish their research and thinking on IT topics of our times. Continuing that tradition, senior editor Linda Runyan has created a new arena for users, vendors, and professional researchers to voice their opinions on important subjects. Premiering this issue is Technology Forum (p. 25), which will become a quarterly feature in DATAMATION. As the subject of our first Technology Forum, Runyan has chosen the most fundamental challenge facing IS execs as they race into the 1990s and the next millennium: software development. We'd also be happy to hear your thoughts on the subject.

Tim Mead

—Tim Mead, Editor-in-Chief

DATAMATION

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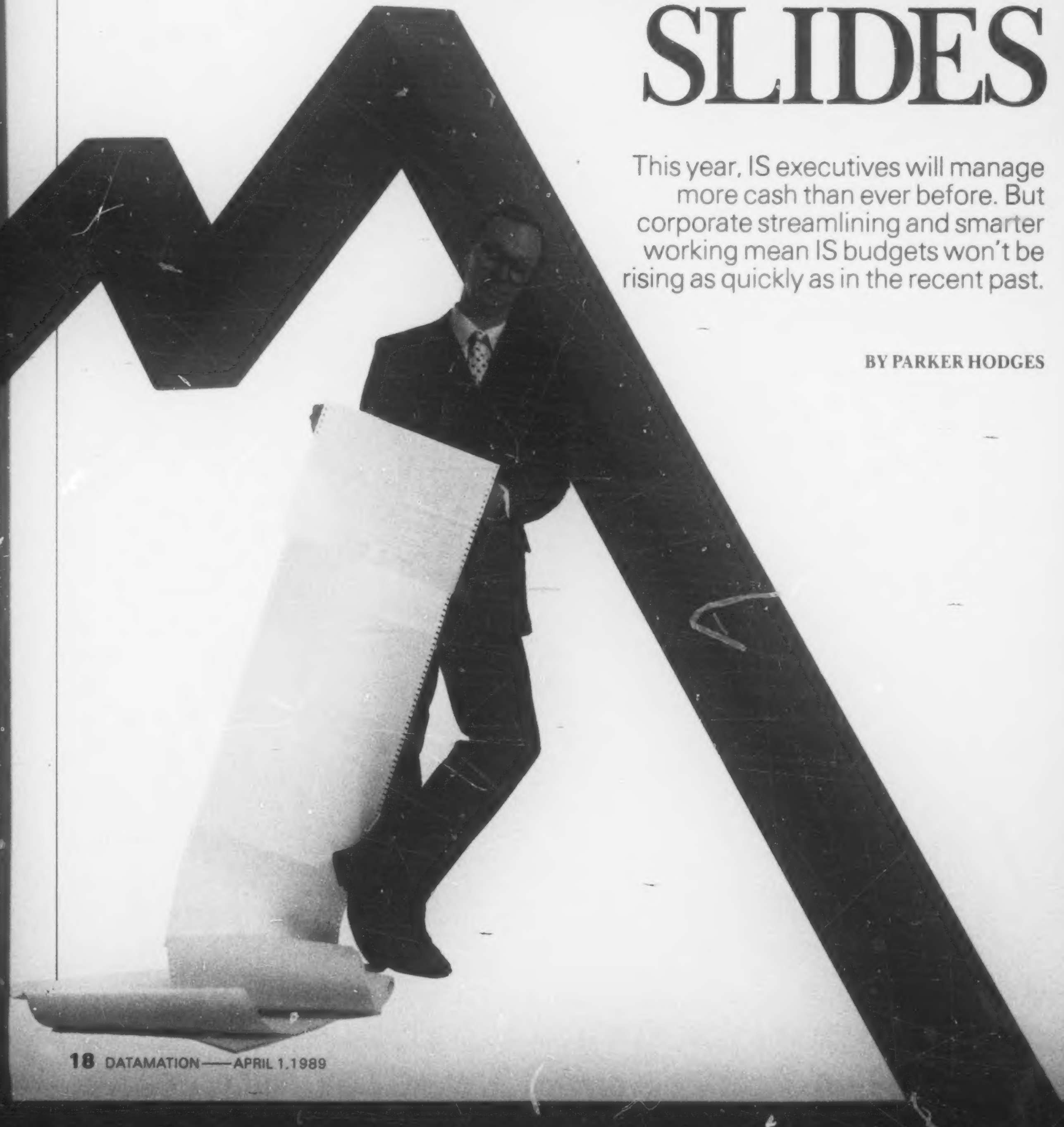
IS BUDGET GROWTH SLIDES



This year, IS executives will manage more cash than ever before. But corporate streamlining and smarter working mean IS budgets won't be rising as quickly as in the recent past.

BY PARKER HODGES

Optimism is tempered by a realistic view of the pressures at work in U.S. business. This has led to the lowest growth in IS budgets since 1985-86.

Optimism about the health of their companies is the note most often sounded when the results of DATAMATION's most recent annual budget survey are played back. A cross section of CEOs, financial officers, and IS veeps and managers told DATAMATION they're happy about George Bush's win, they're glad the dollar has crept up, and they welcome the trend to corporate streamlining. Most importantly, perhaps, the great majority don't expect a recession in 1989. These executives and managers expect the total revenues of their companies or organizations to be up 9.3% in 1989. But for IS organizations, optimism is tempered by a realistic view of the pressures at work in U.S. business. A new scrutiny has led to the lowest growth in IS budgets since 1985-86.

The companies in the survey are building from strength: the average 1988 revenues of those polled easily topped $1 billion, coming in at $1.4 billion. Services companies averaged $773 million, manufacturing companies averaged $1.6 billion, and the average total budgets of the public or government organizations polled approached $1.3 billion. In 1989, the respondents expect their revenues or total budgets to average $1.13 billion.

The slices of these big bucks that end up on IS's plate make for impressive numbers. The average 1988 IS budget among those polled was $1.8 million, ranging from $1.6 million in services and $1.9 million in manufacturing to $2.7 million in the public sector. For 1989, services companies say they'll spend $1.7 million; manufacturers will spend a bit more than they did in '88, still rounding to $1.9 million; and the public sector will average $3 million.

While these are considerable sums, the effects of corporate streamlining and budgetary squeezes have in fact meant that, in most cases, IS is getting a slightly smaller piece of the total pie. Among those polled, in 1988 the average services company spent 2.1% of its revenues on IS; in 1989 IS's cut is down to 2%. At manufacturing companies, 1988's already stringent 1.2% will drop to 1.1% in 1989. The exception is found in public organizations: here, IS took 2.1% in 1988, while in 1989 it will climb to 2.3% of the total budget.

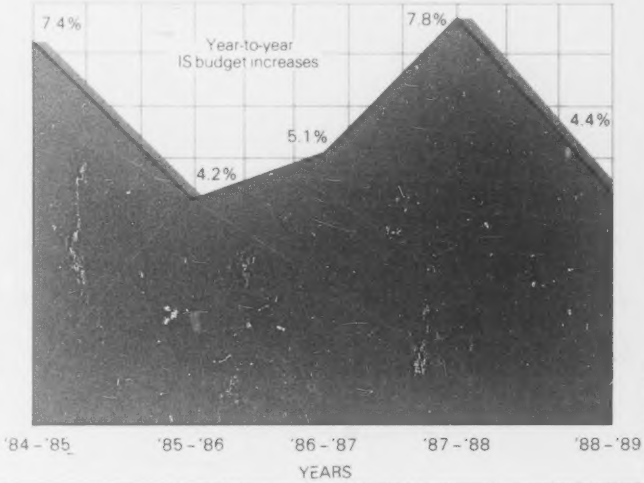
In dollars, though, the direction is up. The average 1988 IS budget is $1.82 million: for services companies the average is $1.62 million; for manufacturing companies, $1.91 million; and for the public sector, $2.72 million. Result: taking the survey population as a whole, 1989 will see an average IS budget of $1.9 million, only 4.4% above 1988's budgets (see "The Shape of the Change").

Across the board, this means an increase of a bit less than 1% in the number of staff reporting directly to IS. About 37% of those polled expect to have larger IS staffs in 1989 than in 1988. Asked to name the reason for the increase, about half of that group cite the development of mission-critical applications, and more than a third happily report that there has been new recognition of IS's crucial role in the future success of their companies or organizations. Another sizable group, about a quarter of those expecting staff increases, say that new IS responsibilities, especially for communications functions, would cause growth. Some respondents—about 6%—say that larger staffs will be needed because their organizations are recentralizing certain IS functions.

In one sector, not always known for its tight grip on a dollar, there seems to have been some success in holding down personnel costs. The public sector is the only one in which personnel costs are lower than costs for hardware and software. In 1988, personnel took 40.5% of the average public sector IS budget, and hardware and software took 41.5%. And public sector IS managers plan to do even better in 1989: only 39.8% of public IS budgets are earmarked for personnel, compared to 43% for hardware and software. By contrast, the private sector is almost a mirror image reversal: 1989 personnel costs will hover near 44% of IS budgets and hardware and software will take a bit under 37% (see "How the Pie Is Divided").

The Shape of the Change

A group of optimistic CEOs and other top managers are keeping a tight rein on budgets for 1989.



Source: DATAMATION

Effects of Streamlining

This year, the DATAMATION budget survey also asked respondents to decide whether the pressures they feel are having "positive" or "negative" effects on their organizations. Almost a third of respondents—31%—say that corporate streamlining would have a positive effect, confirming the theory that technology is an "enabler" for such streamlining. Fewer than half as many—12.3%—say that streamlining would have a negative effect. But in response to a slightly different phrasing of the question, only 9.8% say that "downsizing trends" would have a positive effect on IS; 13.5% say that downsizing would have a negative effect. The most feared possibility, named by 27% of the respondents, is higher inflation and the increased interest rates that would bring.

Some respondents will bear the brunt of streamlin-

Photograph by Walter Wick. Chart by Catherine Francis

ing pressures. About 8.6% of those polled say they expect to run smaller IS staffs in 1989 than in 1988. Half blame "budgetary squeeze" for the cuts. Three other reasons cited by about a quarter of this group are: consolidation due to mergers and acquisitions or reorganization; increased productivity among the remaining IS employees; and a shift toward distributed processing.

Along with distributed processing has come distributed responsibility. About 46% of the respondents say that their companies have people with IS responsibility who do *not* report to dp/MIS. (About 20% of those answering the survey did not respond to this question.) While there is almost no change from 1988 to 1989 in the number of organizations where this trend is apparent, there appears to be a marked increase in the number of non-IS individuals at these companies with IS responsibilities.

Surveying all sectors, in 1988 the mean number of people with IS responsibility was 13.2; in 1989 it rises to 14.6. The biggest jump is taking place in the manufacturing sector. Last year, 13 non-IS people had IS responsibilities; this year, 17.1 non-IS people have such clout, with the biggest jump occurring in the process industries.

Still, some respondents claim a more traditional division of responsibilities: about 35% say all IS responsibility resides in the IS department, with insignificant change from last year to this year. The largest group of traditional companies is found in the services sector, where about 40% have just said no to distributed IS responsibilities. About 25% of public organizations and about 30% of manufacturing companies also report no IS responsibility outside IS.

In this day of PCs, workstations, and end-user computing, different numbers obtain when it comes to shopping for IS equipment: only 30% of all respondents report that no one outside IS has purchasing and specifying authority over IS purchases (see "Spotlight on the Hardware Store").

Non-IS people in the public sector have the most

Micros Take Leaner Slice of IS Purchases

With micro mania fading slightly, micro software and LANs are taking a bigger piece of the IS purchase budget.

	1988	1989 Estimate
Processors		
Personal/microcomputers	33.1%	29.1%
Workstations	4.7%	5.2%
Minicomputers	7.5%	8.0%
Super/minisupercomputers	2.4%	3.0%
Mainframes	4.7%	5.3%
Peripherals		
Memory/solid-state systems	1.4%	1.6%
Disk subsystems	3.2%	2.9%
Tape subsystems	1.1%	1.1%
Printers	6.5%	6.0%
Terminals	3.1%	3.0%
File servers	0.7%	1.0%
Communications		
Private networks (including leased lines)	2.1%	2.4%
Switched & value-added networks	0.5%	0.4%
Local area networks	1.7%	2.3%
PBX	0.7%	0.4%
Other	0.7%	0.3%
Systems Software (if purchased unbundled)	4.6%	4.9%
Applications Software		
Personal/microcomputer	10.7%	12.6%
Workstation	0.9%	1.0%
Minicomputer	2.6%	3.4%
Super/minisupercomputer	1.0%	0.9%
Mainframe	3.0%	2.3%
Other	3.1%	2.9%
	100.0%	100.0%

Spotlight on the Hardware Store

Confirming a trend first identified last autumn by DATAMATION's Mini/Micro Spending Survey (see "The Purchasing Outlook," Nov. 15, p. 18), microcomputers are taking a smaller share of the IS hardware dollar than in the past. In 1988, almost a third of every dollar—33.1%—spent on information systems purchases went to buy personal or microcomputers. In 1989, the PC share is down to 29.1%. Big drops are reported across the board: the public sector spent 31.9% of its IS purchase budget on PCs in 1988; this year it will spend 27.4%. And, in the private sector, PC spending will fall to 29.5% of purchases in 1989 from 33.4% of purchases.

Call an end-user machine a workstation, however, and the trend points the other way, with 1988's 4.7% of the purchase dollar rising to 5.2% in '89. In the manufacturing sector, workstation acceleration is even more apparent: in 1988 4.1% of the IS purchase budget went for workstations; in 1989 respondents predict they'll spend 5.7% on workstations.

The midrange results are mixed. In the public sector, last year was a lean year for minis, consuming only 6.6% of purchase dollars. This year, by contrast, fully 12% of public sector IS purchases will be minis. The reverse is true, though less dramatically, in manufacturing: in 1988 11.2% of purchase dollars went for minis; this year 9.6% will go for minis. Services companies stayed fairly flat, moving slightly up from 5.6% to 5.9%.

Minisupers and supercomputers are also taking more purchase dollars. Overall, the mean percentage of the purchase budget going for minisupers and supers rises from 2.4% to 3%, with the biggest increase occurring at manufacturing firms, where the mean rises from 3% to 4%. Respondents in the computer and electronics industries are the big spenders here: 8.3% of purchase dollars are headed for minisupers and supers in 1989.

Mainframes are up, but only slightly. In 1988 the big machines took an average of 4.7% of purchase budgets. In 1989 they'll consume 5.3%, with big increases in the buying plans of transportation companies; food, entertainment, and travel companies; and the federal government and educational institutions.

influence: where only about five non-IS people per company in services or manufacturing have buying and specifying authority, organizations in the public sector report that in 1988 an average of 17 people had such power in each public sector organization.

Still, the survey shows that about 77% of all information technology systems, software, and services is directly purchased by central IS. About 23% of total systems, software, and services is being bought by business units or departments within the business units.

Despite moves to more strategic use of information technology, the back office still takes the lion's share of IS's capabilities, consuming an across-the-board mean of 49.3% of resources. Engineering and research applications consume a mean of 11.2%; manufacturing applications, 8.6%; marketing and sales, 12.8%; distribution, 5.2%; and "other," 13%.

Taken across the entire surveyed population, these particular statistics can be misleading. Only when separated does a true picture of IS activities emerge. At services companies, back office and administrative chores typically consume 51.8% of IS resources. In public organizations, the back office chews up even more, 56.8%. At manufacturing companies, however, the back office's cut drops to an average of 38.4%. Engineering and research also show marked differences between sectors, with services companies spending 9.8%, public organizations 12.8%, and manufacturing firms 14%.

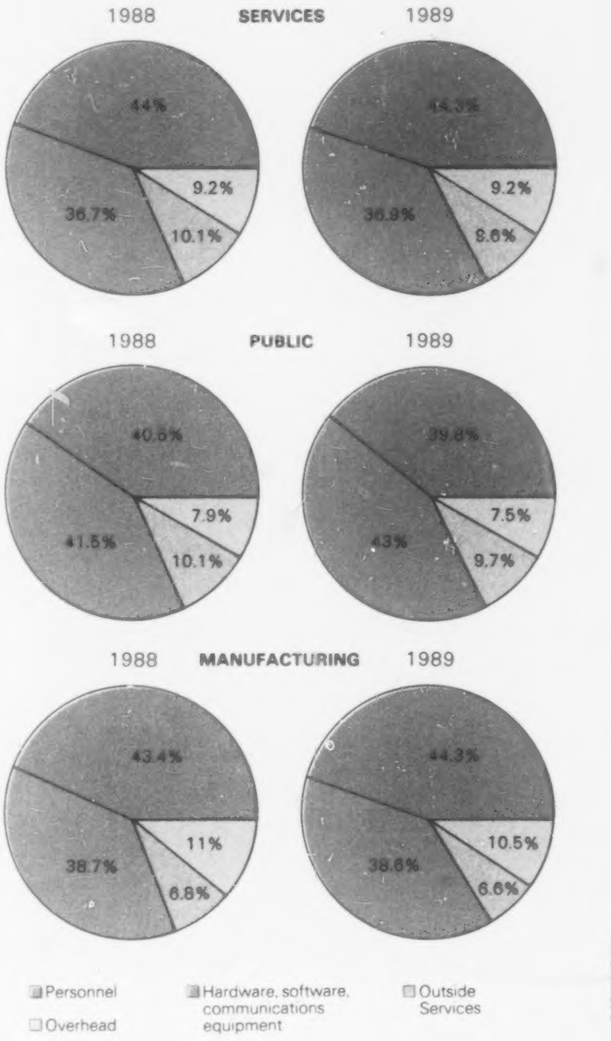
The biggest difference is in the share of resources devoted to manufacturing: services companies use just 3.1%; the public sector even less at .3%; and the manufacturing sector weighs in with a mean response of 25.6%.

Marketing and sales applications also show marked differences between sectors, with the public sector using just 2.9% of its resources here. Services companies at 13.7% and manufacturing companies at 15.4% are much closer to one another.

In applications for distribution, services companies are the big users, devoting 6.3% of resources, with the public sector and manufacturing almost tied at 3.6% and 3.5%, respectively. The ever present "other" category finds the public sector devoting almost one-quarter of its power here; and "other" applications require that services use 15.3% and manufacturing 3.3% of their resources.

How the Pie Is Divided

IS in the public sector has the lowest overhead and personnel costs; manufacturing companies use the fewest outside services; and services companies spend the least on purchases.



Source DATAMATION

Methodology

On November 11, 1988, 3,000 questionnaires were mailed to a random sample of DATAMATION subscribers.

The sample was limited to one name per site for those whose titles are within Corporate, Finance, and General Management. Names were selected in such a way as to include a representative sampling of both large and small companies (over and under 750 employees). The sample was drawn on an "nth-name" basis from those who qualified according to the above criteria. That is, names were selected at a specified interval throughout the list in order to obtain a systematic random sample.

By December 2, 1988, 593 completed questionnaires had been received by the Cahners Publishing Market Research Department, indicating a response rate of 19.8%. The results were tabulated, and this report was written based on the data in these 593 surveys.

Chart by Catherine Francis

Payoffs Down the Pike: A CASE Study

A DATAMATION/Price Waterhouse survey shows that CASE pioneers will be rewarded with improved software quality—but first they must tailor a basically inflexible technology to their environments.

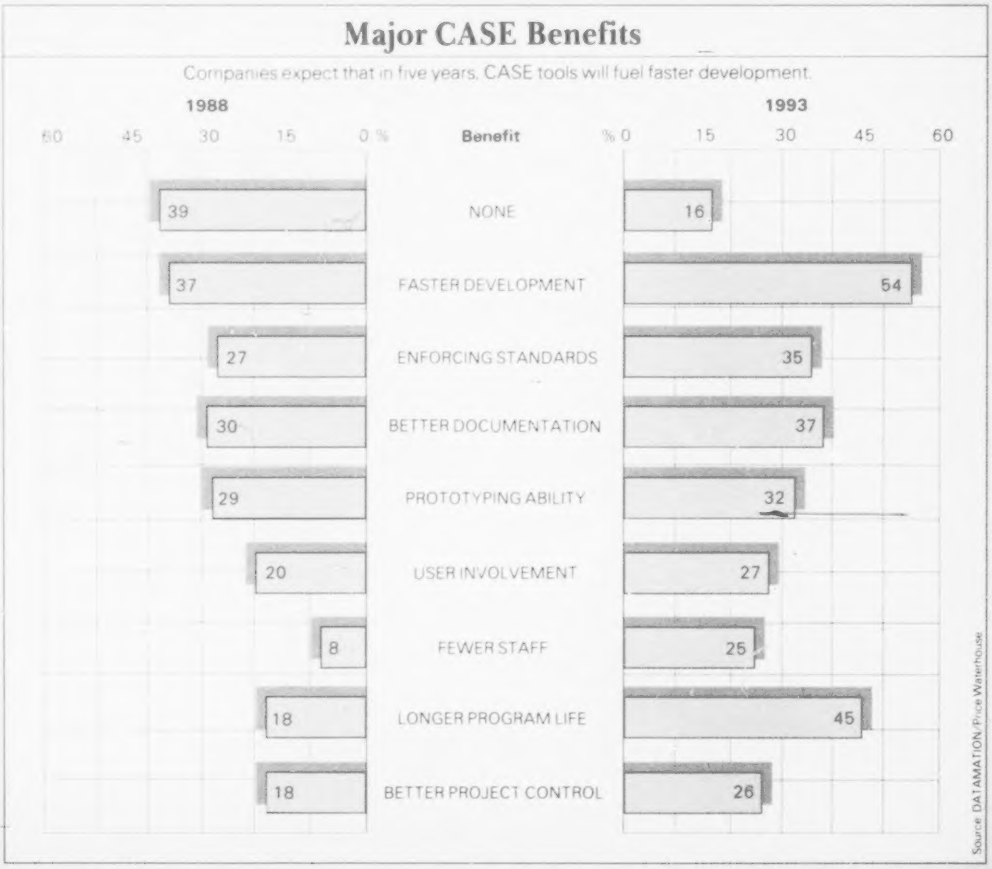
BY NORMAN STATLAND

Improving Software Quality

Most of the pioneering U.S. companies that are just beginning to plug in computer-assisted software engineering (CASE) products see their payoffs coming in the future. The experience of these companies shows that in the short run, CASE tools have negligible effect on productivity. The main reason is that CASE technology must be used with a formal methodology to be effective. The patience of those pioneers, however, promises to pay off three years down the road when CASE technology is expected to dramatically improve software quality. The improvements will stem directly from the decreased maintenance and increased productivity that will accrue over the total life of a system developed with CASE tools.

A special DATAMATION/Price Waterhouse opinion

CASE Benefits


Major CASE Benefits

Companies expect that in five years, CASE tools will fuel faster development.

Source: DATAMATION/Price Waterhouse

CASE technology must be used with a formal methodology to be effective.

survey reveals that in most organizations CASE tools are only in the initial stages of implementation. In fact, our sample shows that the technology is currently affecting only one out of four installations in the U.S. But within the next three years, as it becomes more widespread, CASE is expected to impact one out of every two American organizations, according to our survey.

During the startup stage, expectations for CASE are relatively modest regarding productivity. Fifty-seven percent of the respondents say they didn't think CASE would have any effect on productivity; another 11% feel that the technology would actually have a negative effect on software development productivity.

Although most (68%) of the current users see no direct productivity improvements, they cite several CASE benefits that actually contribute to better productivity. Among the advantages are faster development and a more uniform level for interim products within the system development life cycle (SDLC). Therefore, it seems that within these organizations, productivity is being measured primarily in terms of total elapsed time in the software development process.

The productivity prognosis is considerably brighter over the longer term. Fifty-one percent of the organizations sampled predict that CASE would spawn software productivity jumps of up to 100% over the next five years. Productivity surges of up to 200% by 1993 are foreseen by 20% of the CASE users surveyed.

Fifty-four percent of current CASE customers expect to see much quicker software development by 1993, as a result of the technology. The most marked difference between today and tomorrow comes in the maintenance area. A whopping 45% of the companies predict that within five years, longer program life would be the big plus of using CASE tools.

Program Life Extension

The reason for the expected program life extension lies in the level of decomposition that can be achieved via a CASE tool in the analysis and design stages of the SDLC. Today, most people are not using CASE for decomposition. This is reflected by our sample, which shows that only 18% of users expect longer program life as a result of CASE. Better project control and standards enforcement are also expected to be bigger benefits in another five years.

The case for CASE today shows a somewhat different picture. Organizations responding to the survey report that the current selling points of the technology are faster software development, improved documentation, and better standards enforcement.

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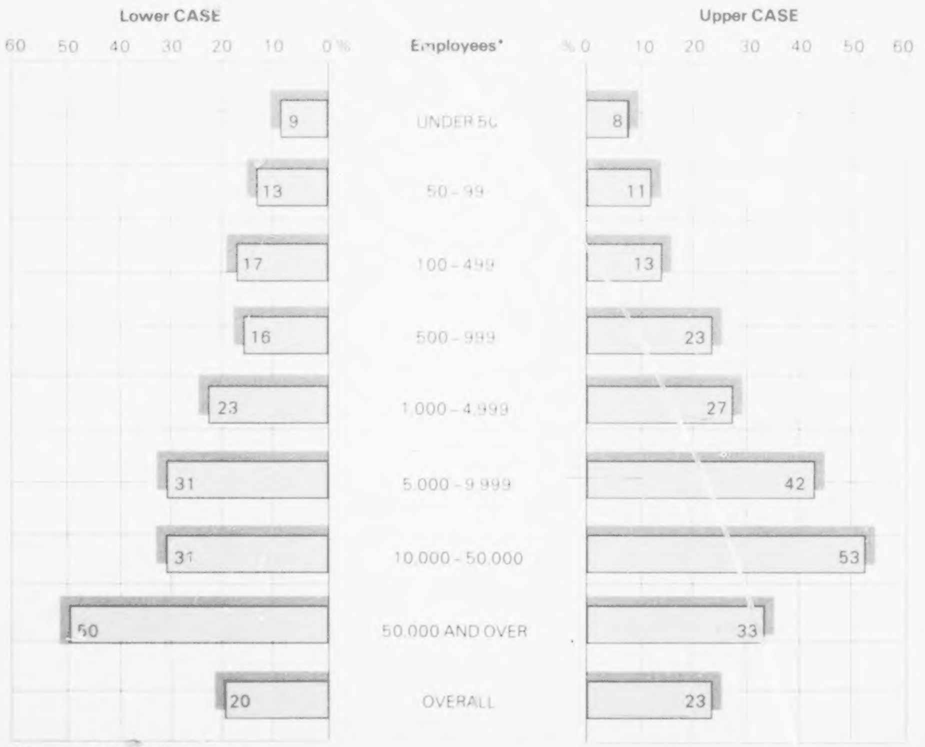
Size Determines CASE Spending

CASE Tool Usage

Larger companies are most actively using upper CASE tools



*Measured by companies' employee count

Source: DATAMATION/Price Waterhouse

Improving Software Development

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SEPGs consist of roughly 1% to 3% of an organization's software development professionals, with the practical minimum being four to five experienced people. Initially, group members should be recruited from within the organization to ensure that they have the necessary corporate knowledge and in-house technical expertise.

Organizations assessed by the SEI are given guidance to help them establish their own SEPGs. The SEI also promotes and supports these groups by sponsoring process workshops and symposia.

Today, SEPGs are not widespread except within the organizations evaluated by the SEI. These are the organizations that are achieving awareness of where they are and where they have to go in the complex software development process. Only by focusing on steady improvements in that vital process, will true software progress come.

Watts S. Humphrey, who is director of the software process program at the SEI at Carnegie Mellon University, Pittsburgh, joined the Institute after logging 27 years at IBM as a software manager and executive. Some of the material for this article is based on his book, Managing the Software Process, *to be published this May by Addison-Wesley Publishing Co. Inc., Reading, Mass.*

Payoffs Down the Pike

continued from page 33

Twenty-nine percent like the fact that they could use CASE to provide a platform for prototyping. Users forecast that CASE's prototyping muscle will be even stronger by 1993, when screen painters and end-user reporting tools are incorporated within the CASE environment.

In conducting the survey, Price Waterhouse considered Upper CASE tools such as tools for analysis and design, Lower CASE tools for automated code generation, and integrated project support environment (IPSE) tools that integrate analysis, design, and construction tasks with project management facilities within the SDLC.

From the survey, it appears that the usage of CASE depends on a company's overall information technology budget. The bigger the budget, the more money that can be devoted to making the major investments in the training and in the methodology needed to implement Upper CASE tools.

It naturally follows then that the companies using Upper CASE are the same ones that have historically been pioneers in applying new technologies. Our survey indicates that those firms fall into the large- to midrange categories. In the context of this survey, the number of employees was used to establish company size.

Twenty-three percent of all survey respondents say they are using an Upper CASE tool; 25% plan to use one for analysis and design chores. Twelve percent of companies in the 5,000-to-10,000-employee bracket are using tools for analysis and design tasks within the SDLC, while another 28% have overall plans to deploy Upper CASE products.

In firms with under 500 employees, 70% have no plans to explore Upper CASE tools. This may be a reflection of the level of sophistication within the organizations. Or it may be that management's concern over system productivity has yet to surface within those particular organizations. In either case, the low usage of Upper CASE products in smaller companies is understandable because of the costs involved in implementing them.

Further along the CASE ladder, 32% of all companies note that they were currently working with integrated project management tools; 21% have plans to use them. Roughly 40% of interviewed companies that range in size from 1,000 to 10,000 employees are making use of automated project management tools. Another 30% of same size firms predict they will be plugging in these tools within the next 12 months. However, it's evident that to take full advantage of either Upper or Lower CASE tools, the existing software staff will have to be more extensively trained in the use of structured analysis and design formalisms.

Twenty percent of our sample report using Lower CASE products; another 26% indicate they are planning to. Half of the larger companies (with employee rosters of 10,000 to 50,000 people) are already applying Lower CASE wares. The slower implementation of Lower CASE may be related to the protracted acquisition process for these expensive tools. Also, there is mounting evidence that developers are experiencing frustration because of their unrealistic expectations that CASE will generate complete programs for all situations.

In conducting the study, Price Waterhouse asked companies for situations where they had rejected or not even considered CASE tools. The general rejection level was between 2% and 4%, indicating that among our sample there are very few firms that have tried and rejected CASE technology.

That doesn't mean CASE is trouble-free. Three main CASE problem areas are pointed up by the DATAMATION/Price Waterhouse survey: the extreme amount of hype generated by sales personnel and the press; the costs associated with bringing multiple single-user copies of Upper CASE tools into a synchronized data repository; and the frequent frustration of people who want to tailor the basically inflexible CASE tools to particular methodologies or standards already in place within an organization.

Norman Statland, who is national director of information resource management services at Price Waterhouse, is the author of Controlling Software Development *(John Wiley & Sons, New York, 1986).*

From CASE to Software Factories

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there are two key issues that have to be resolved before further progress on Software Factories can be made. First, there must be acceptance of user interfaces. And, second, a commitment must be made to train software specialists in the complexities of large systems development projects and processes. Many of today's software developers in Europe and elsewhere lack the skills needed to take full advantage of the new and evolving software production environments. Fortunately, educational institutions are slowly responding to these needs.

Within a company, training costs are usually not factored into the total price of a CASE product. An integrated CASE system that supports a number of development tasks costs at least $100,000. Even more expensive is the training for the new environment. For every employee trained, you can add another $100,000 to the CASE price tag. This calculation is based upon the fact that a salaried employee is pulled off his regular, revenue-generating activities during the learning process. Nonetheless, in the long run, companies must make these intellectual investments if they hope to partake in the productivity gains promised by the Software Factories of tomorrow.

Herbert Weber is a full professor of computer sciences at the University of Dortmund in West Germany. At the university, he is the leader of the software technology group that is spearheading European research efforts to create new software production environments. Also working on this article was Svein Borgersen, president of Princeton Global Technologies Inc., Princeton, N.J.

Cutting Through The CASE Hype

The French are investing the most in CASE tools, the Australians are optimistic, the Japanese remain skeptical, and the U.S. is looking for reverse engineering.

BY KIT GRINDLEY

Computer-Aided Software Engineering (CASE) is the latest offering in 30 years of promised panaceas for curing the pain of systems development. Still, meeting project deadlines remains the world's number one IS problem, and the delay in delivering programs, rather than any technical shortcomings, has become the single overriding constraint on IS progress.

Can CASE prove successful in remedying the problem? It should—eventually. CASE makes use of CAD/CAM techniques, which have already realized massive improvements in cutting through the layers of detail design that stand between the production engineer and his objectives.

What works for one branch of engineering should work for another. But not yet; not according to a recent DATAMATION and management consultants Price Waterhouse survey of over 3,000 IT executives in the U.S., Japan, Australia, France, and the U.K. The survey found that so far only 20% of installations worldwide are using the technique, 7% have tried and rejected it, and over 30% of the respondents feel the main problem is "cutting through the hype" of unsubstantiated claims for the products (see "Barriers to Success").

"Suggestions that just entering in corporate objectives through the screen will result in the automatic and effortless production of programs may get us to open the brochures, but it won't have the same effect on our wallets," comments one respondent. French wallets seem to have succumbed to the sales pressure more than most however, and France leads the world in the automation of programming, with over a third of its installations claiming to use CASE tools in one shape or another. This compares with only a fifth of installations using the techniques in the land of CASE skeptics—Japan.

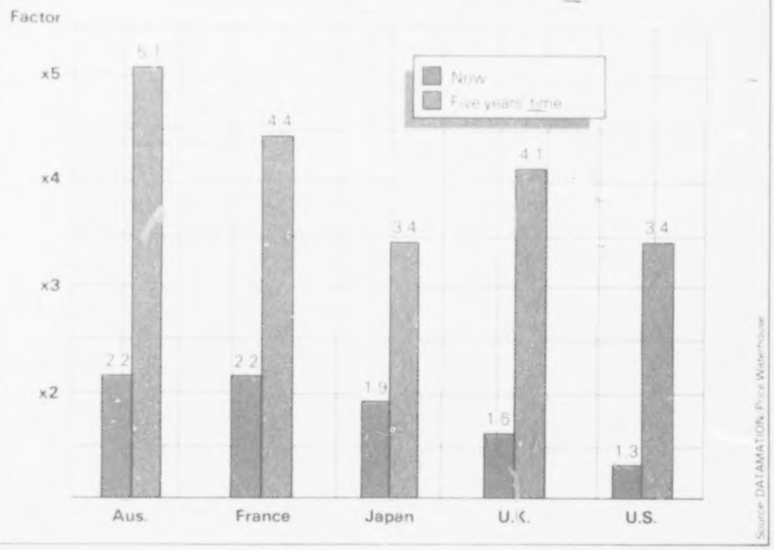
CASE tools come in three distinct shapes: upper CASE, which helps the analyst discover and specify systems requirements; lower CASE, which aids and abets programming; and IPSE (integrated programming and systems engineering), which aims to automate the technical management task.

Upper CASE and IPSE can be bought relatively cheaply, so experimentation in these areas can be a low-cost project. But lower CASE, which typically generates working COBOL programs, can knock a sizable hole in the IS budget, and it's hats off to France and the U.K., who are leading the world's investments in this area (see "Worldwide CASE Status").

Respondents perceive the main benefit of CASE to be improved productivity (see "The Productivity Promise"). The improvement being achieved worldwide by those using the technique today is an 84% cut in systems development delivery time. The best performers are Australia and France, who claim to have more than doubled their productivity. In five years time, most IS executives believe the technique

The CASE Productivity Promise

The Australians are optimistic, but U.S. and Japanese users remain cautious about predicted productivity gains.



Source: DATAMATION, Price Waterhouse

Chart by Catherine Francis

Worldwide CASE Status

French companies lead the world's users in the global CASE stakes.

	(by percent)	Aus.	France	Japan	U.K.	U.S.
Upper CASE	Using now	16	30	9	22	23
	Plan to use	33	29	20	30	25
	Rejected	5	4	17	5	3
	Not yet considered	46	37	54	43	49
Lower CASE	Using now	17	36	21	27	21
	Planning to use	32	25	17	27	21
	Rejected	9	3	16	8	4
	Not yet considered	42	36	46	38	49
IPSE	Using now	31	23	3	27	32
	Plan to use	17	33	12	25	21
	Rejected	8	5	23	8	3
	Not yet considered	44	39	62	40	44

Source: DATAMATION/Price Waterhouse

Barriers to Success

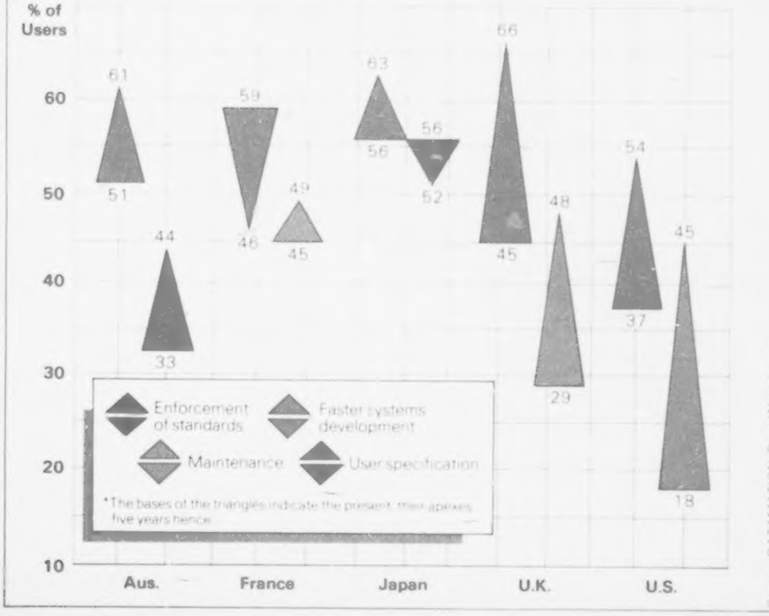
Users rate cutting through the industry hype and choosing the right products as their biggest CASE problems.

	Aus.	France	Japan	U.K.	U.S.
Unintegrated systems (using standalone CASE)		2nd			
Choosing/assessing products	1st	1st	2nd	3rd	
Implementation			3rd		
Justifying the cost	2nd	3rd		1st	2nd
Cutting through the hype	3rd		1st	2nd	1st
Adapting to methods and standards					3rd

Source: DATAMATION/Price Waterhouse

Predicted CASE Payoffs

Asked to predict the shift in CASE benefits between now and 1994,* most users foresee increased improvements, except French and Japanese users. There is a decline in the percentage of French users who anticipate improved systems development with CASE, and of Japanese users who mention standards enforcement as a CASE benefit.



*The bases of the triangles indicate the present, their apexes five years hence.

Source: DATAMATION/Price Waterhouse

Chart by Catherine Francis

will come good however, with a world average expectation of a fourfold speedup in programming resulting from the use of CASE. Australians are the most optimistic, and have pinned their hopes on producing systems in less than a fifth of present delivery times.

French IT executives, who are among today's leaders in claims for improved productivity, reveal an interesting trend of future expectations. Fifty-nine percent of installations in France state the main benefit now is faster systems development (see "Predicted CASE Payoffs"). In five years' time, however, this figure will fall to 46%, and by then 49% expect the main benefit to be the increased life of programs developed using CASE tools, and the beginnings of a solution to the widespread problems of program maintenance.

Interviews revealed that many panelists feel the claims of increased productivity are just part of the sales hype, and that the initial programs developed under a CASE environment actually take longer to produce. "After installing upper CASE tools, we found that our systems analysts took longer to produce specifications, even after allowing for the learning curve," says one.

But while delivery times went up, so did user satisfaction. "The screen-based systems make flow-charting and systems design so fast that no one's inhibited from making changes anymore as they improve their ideas," adds another IS executive.

Cracking the program maintenance problem is stated as a main benefit of CASE by 29% of installations in the U.K. and 18% in the U.S. But these figures rise to near 50%, alongside France, when it comes to examining expectations of CASE for five years' time.

Interviews in the U.S., where the stranglehold on progress exercised by vast existing COBOL programs is the greatest in the world, also showed strong hopes for a fourth set of CASE tools—reverse-engineering products.

"Techniques already exist for feeding in code and getting out data models of what these programs are doing," points out one U.S.-based IS manager. "Once you stand the thing on its head in this way you have the possibility of feeding your existing programs in at the back, changing the data models you get out at the fro. feeding them back in, and updating yo systems automatically."

Kit Grindley is a management consultant for Price Waterhouse and professor of systems automation at the London School of Economics.

INFORMATION ECONOMICS

IS Operations: The Economy's Impact on Your Department

Cheering unemployment figures may mean difficulty in hiring programmers and analysts.

BY MADELINE FRANCHI

With the start of 1989, the U.S. entered its seventh year of uninterrupted economic growth. This longest peacetime expansion has moved people from the unemployment line to the assembly line, swelling the ranks of the employed.

Just within the period 1985 through 1988, civilian employment climbed to 115 million from about 107 million, an increase of 7%. In 1988, the U.S. unemployment rate averaged just 5.5%, a drop from over 7% in the mid '80s. In some areas of the country, the unemployment rate was even lower.

Continued (though slower) economic growth for 1989 and 1990, combined with a decline in the number of entry-level workers, means that the market for labor will get tight. For some occupations, and in certain geographic areas, the shortage of both skilled and unskilled workers is already pushing up wages or causing service cutbacks as job openings go unfilled. If you are a manager making staff decisions, you may have already experienced firsthand the effects of the labor crunch.

Of great interest, of course, is the employment and earnings outlook for computer and data processing professionals. In the last several years, employment of computer systems analysts was growing almost four times as fast as total employment. According to Bureau of Labor Statistics (BLS) data, employment of mathematical and computer scientists skyrocketed 28%, to about 730 thousand in 1988 from an average of 571.3 thousand persons in 1985, and it's still heading up. Right now, computer systems analysts make up about 45% of that occupational category.

Similarly, employment of technicians (excluding health, engineering, and science) multiplied to about 1,145.3 thousand in 1988 from an average of 1,025.5 thousand in 1985. That was a gain of close to 12%. Computer programmers comprise over 60% of the employment in the technicians' grouping.

Computer and data processing professionals are among the fastest growing occupations, in terms of both the actual number of jobs and the growth rate, based on BLS projections to the year 2000. By the turn of the century, 251 thousand more computer systems analysts and 335 thousand more computer programmers will be needed than in 1986. These gains will be spurred by the ever-expanding applications for computers requiring more workers, particularly in the computer and data processing services industry.

Results of the 1987 BLS Wage Survey of the computer and data processing industry revealed that top-level systems analysts and systems programmers were the highest paid workers in the industry, with average pay generally in excess of $800 a week. By metropolitan area, average weekly earnings of all levels of systems analysts ranged from about $676 in Washington, D.C., up to $860 in and around San Jose.

To help IS executives, Information Economics reports on economic issues and trends that affect the running of your department. Once each quarter, Information Economics reports on the sales performance of the information technology industry in the U.S. Other quarterly reports deliver capsule summaries of the economic health of various industry sectors. More information can be obtained from Cahners Economics Department, 275 Washington St., Newton, MA 02158, (617) 964-3030.

Well-Paid Programmers and Analysts

Systems analysts and systems programmers are among the best-paid workers in the U.S.

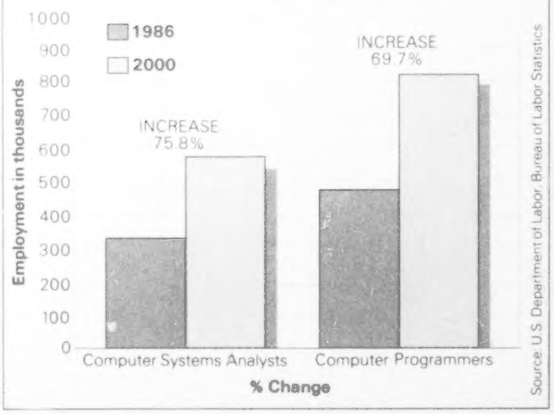
Average Weekly Earnings 1987*	Systems Analysts	Systems Programmers
San Jose	$859.5	NA
Los Angeles-Long Beach	839.0	862.5
San Francisco	823.5	NA
Oakland	768.0	NA
Philadelphia	766.0	NA
Chicago	752.5	815.5
Denver	751.0	676.5
New York-Newark	744.0	695
Boston	743.0	NA
Cleveland	728.5	NA

*Selected metropolitan areas

Source: U.S. Department of Labor, Bureau of Labor Statistics, Bulletin 2318.

IS Occupations Are Among The Fastest Growing

Growth in these IS jobs will be fired by new computer applications.



Source: U.S. Department of Labor, Bureau of Labor Statistics

Chart by Paragraphics

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EXCLUSIVE REPORT: Local Area Network Growth Surges

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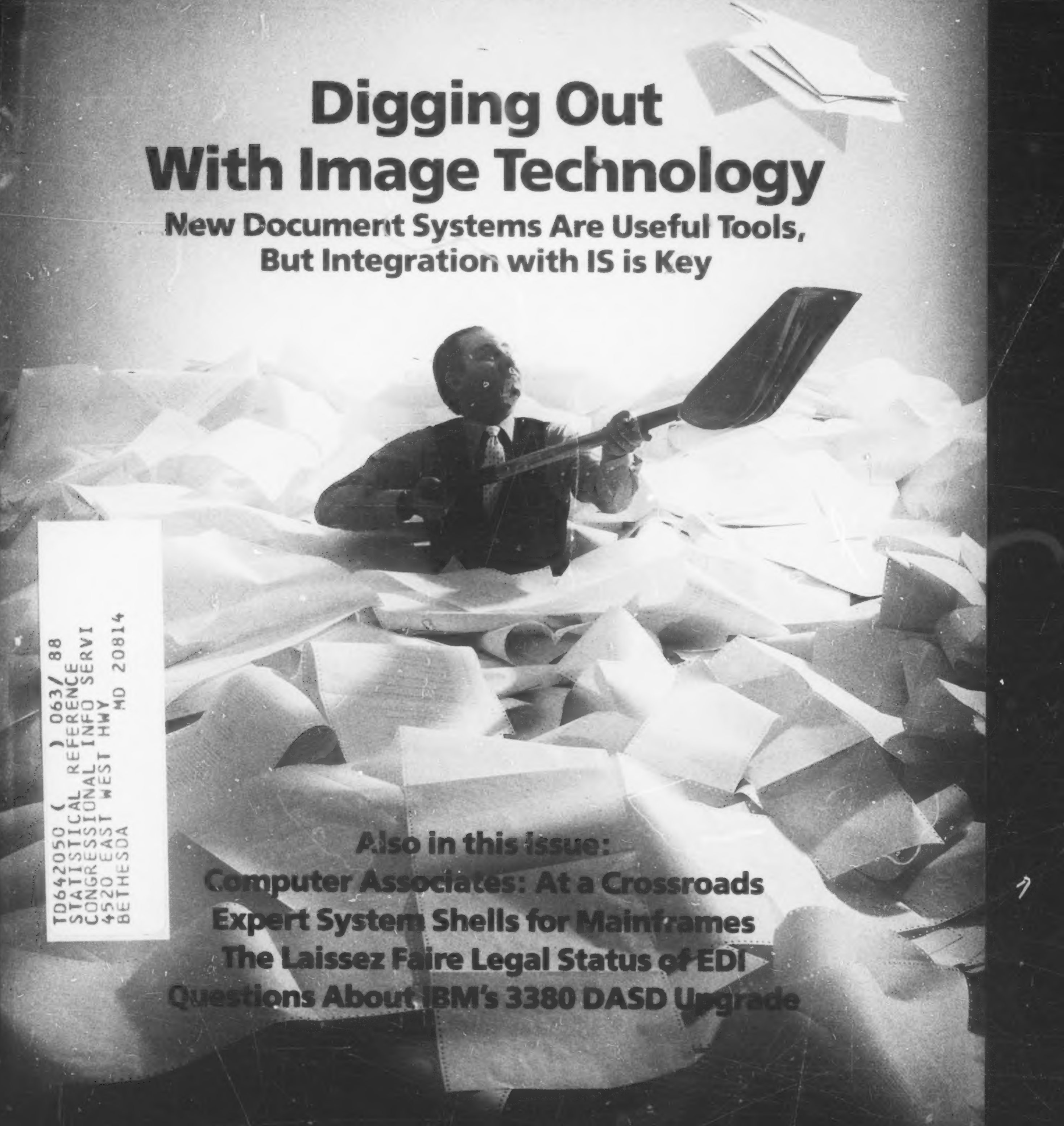

Digging Out With Image Technology

New Document Systems Are Useful Tools, But Integration with IS is Key

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- Expert System Shells for Mainframes
- The Laissez Faire Legal Status of EDI
- Questions About IBM's 3380 DASD Upgrade

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DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

Digging Out with Image Technology 18

BY MARSHA J. FISHER Document image processing captures a digital copy of an original document and promises users like banks, credit grantors, and insurance companies greater efficiency, reduced cost, and better customer service. But integrating the technology with conventional information systems and networks isn't easy. Still, it's not hard to see why these systems have grabbed the attention of IS professionals everywhere: a recent survey of image processing users revealed that in a whopping 99% of installations, worker productivity improved by 20% or more.

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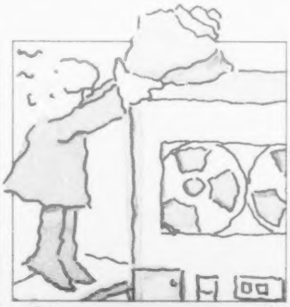

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LAN Growth Surges 32

BY PARKER HODGES DATAMATION's second Connectivity Survey finds there has been a dramatic jump in the penetration of LANs. Now, almost 56% of the respondents say LANs are at work in their companies—an increase of than 50% in one year. This year, across the organizations polled, over 34% of PCs and over 41% of users at an average site are connected to a local area network. Here's a look at today's connectivity realities.

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BY JOHN J. POPOLIZIO AND WILLIAM S. CAPPELLI Corporations are looking to embed the inferencing capabilities of expert system shells into their existing mainframe transaction processing environments. The result: AI is no longer limited to the PC; it is moving to the mainframe.

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It's DASD Time Again 50

BY JEFF MOAD Once the new Blue 3390 DASD arrives, customers will have to ask themselves some questions, such as how aggressively they want to embrace IBM's new System-Managed Storage (SMS) environment.

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Legal Laissez-Faire 54

BY SUSAN KERR Gentlemen's agreements about who will be responsible for erroneous EDI transactions are the rule, but as the use of EDI widens, so does the potential for legal disputes. Who then is liable if a transmission fails or is in error? Complicating the question is the fundamental debate over whether computer interchanges can result in legally enforceable contracts for the sale of goods.

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Computer Associates: At a Crossroads 61

BY RALPH EMMETT CARLYLE Charles Wang built CA, the world's largest software company, by acquisition. Now he's at the helm of the first independent software company in history to top $1 billion a year in revenue—the company many refer to as "the IBM of the software industry." Wang's challenge is to integrate CA's vast suite of products, and to relate to higher-level IS managers. Here's the inside story of a company you may *have* to deal with.

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EDITED BY LINDA RUNYAN A report on products, services, and methodologies for IS managers in the financial services sector. Future editions will serve managers in the government and manufacturing sectors. (Not included in all issues.)

INSIDE DATAMATION

Getting Closer to Fulfilling a Promise

The "promise of computing," a phrase often bandied about in the computer industry, is often abused. Buy this software on this or that machine and your organization will be catapulted to the front ranks of your market. Don't invest in this or that technology and your company may find itself at a competitive disadvantage. Of course, much of this kind of talk is just good old-fashioned hyperbole. When all is said and done, most users have trained themselves to look upon the equipment for what it is—a tool that aids a business process or function.

Every once in a while, though, a technology comes along that has such immediate application and tangible benefit that it almost lives up to the hype generated for it. Document image processing just may be one of those technologies. As our section editor, Marsha Fisher, reports in this issue's cover story, "Digging Out with Image Technology," (p. 18), document image systems are being embraced by many different types of organizations worldwide. And for good, not hyped, reasons.

"Users, particularly those in paper-intensive, customer service-oriented industries, are buying into image processing in growing numbers because they have recognized that its benefits, both intangible and concrete, can far outweigh the cost of its special architectural and operational requirements," Fisher writes. "A recent Yankee Group survey of 2,000 users revealed that in a whopping 99% of installations, worker productivity improved by 20%."

With gains like this, it isn't difficult to see why the document image processing market is conservatively predicted to grow at a compound annual rate of 29.5% from 1988 to 1992, reaching $594 million. The numbers are impressive; but what must also be impressed upon users of this technology are some of the challenges that must be met in its application.

First and foremost, Fisher points out, is devising a strategy that makes sense for your particular business. Installing a document image system without determining how it fits into your company's overall IS environment is the wrong way to proceed. Next, the integration of these systems into your conventional IS structure is key if you are to realize the full potential these new systems have to offer. Following these steps, along with others that Fisher illuminates in our cover story, will help give your company firm footing on the road to fulfilling computing's promise. (In our next issue, we will feature a roundtable of users of document imaging systems).

Computer Associates' Latest Challenges

Photograph by Bill Kelly

CA's WANG (c.) ponders a question from DATAMATION's Brousell (r.) and Carlyle.

Making promises, of course, is the stock-in-trade of the vendor community, and often, the bigger the company, the bigger the promise. Examining these promises—how and when they will be fulfilled—is the purpose behind our continuing major vendor profile series. This issue we take a hard look at Computer Associates International Inc., the Garden City, N.Y., software phenomenon that in a few short years has grown to be the world's largest software company, and the first to achieve $1 billion in sales. On the basis of interviews with users, competitors, and analysts, as well as an exclusive interview with CA's gutsy founder and CEO Charles Wang, DATAMATION senior writer Ralph Emmett Carlyle finds in "Computer Associates: At a Crossroads" (see p. 61) that CA is at a critical juncture. Rapid growth has meant rapid success, but now CA must integrate its vast suite of in-house-developed and acquired products, improve communications with users, and appeal to higher-level IS managers.

David R. Brousell, Executive Editor

DATAMATION

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LAN Growth

An IS rite of passage has occurred: a concept has passed from buzzword, through acceptance, and has arrived at majority usage. Connectivity is a widespread reality. Almost 64% of the respondents to a DATAMATION survey of its readers say their company or organization have a strategic plan to "fully interconnect its computer systems." And there has been a dramatic jump in the penetration of local area networks. In a similar poll conducted last year, just 36% of respondents said their companies had installed LANs. Now, almost 56% say LANs are at work in their companies, more than a 50% increase in one year.

About half of the 44% who report no local networks at their companies say that they'll soon have them: over 19% of the no-voters say they'll be networking within a year, another 26% within three years, and just over 5% within five years. About 22% of the total sample say they'll remain incommunicado for "the foreseeable future."

(The organizations most likely to be aiming at full connectivity are those that have committed to OSI, SAA, or Unix technology strategies. Least likely to be aiming at full connectivity are current basic IBM PC users.)

The percentage of PCs that are hooked to LANs has risen. Last year's survey found that just 30% of PC users were hooked up to LANs. This year, across the organizations polled, over 34% of PCs and over 41% of users at an average site are connected to a local area network. But the story changes when the responses are looked at on an industry-by-industry basis. Here, the reality is feast or famine. Compare, for example, the most networked and the least: companies in the communications business and those supplying gas and electricity. As might be expected, the former do a lot of communicating in-house: at communications utilities, an average of 55% of PCs are connected to a local area net. At gas and electric utilities, on the other hand, only 15% of PCs are tied together (see "What's On-Line, Who's On-Line" and "The LAN Reality").

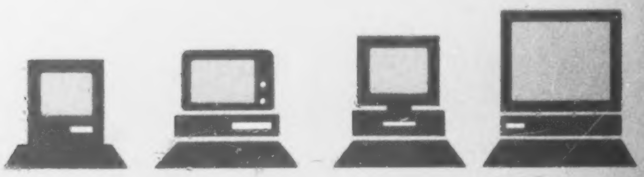
Workstations show a different networking profile. More of these machines are standalone, with the great majority of respondents reporting that fewer than 10% of their workstations are networked. (The only industrial sector in which the survey shows that a majority of workstations are networked is a polyglot sector made up of construction, mining, and agriculture companies, and the sample from this sector may be deceptively small.)

The push toward local networking has come from both end users and the IS staffs of the organizations polled, with IS taking the lead. End users have been the force behind LANs at just over 29% of the companies polled; IS has taken the LAN lead at almost 38% of the companies. Corporate management hasn't shown dramatic interest in LANs at most companies: only 9%

What's On-Line?

The percentage of PCs that are connected to a LAN is affected by both the size and technology track of a company or organization.

Technology Track



% of PCs on LANS	Macintosh	MS-DOS IBM PCs	PS/2	Unix
10% or less	37.4	41.5	38.2	26.1
11-20%	4.8	9.3	11.8	8.7
21-30%	9.7	8.3	14.7	8.7
31-40%	6.0	4.7	2.9	7.3
41-50%	6.0	4.1	4.9	4.4
51-60%	4.8	3.6	3.9	5.8
61-70%	8.4	4.7	5.9	4.3
71-80%	12.1	8.8	6.9	15.9
81-90%	3.6	5.7	5.9	8.7
91-100%	7.2	9.3	4.9	10.1
Mean	37.2	34.7	31.7	44.6

Source: DATAMATION

Surges

In DATAMATION's second Connectivity Survey, most respondents say they've got LANs. Here's a look at today's connectivity reality.

BY PARKER HODGES

of the respondents report that corporate management has shown the greatest interest in using LANs.

Here, too, the story changes in different industries. At suppliers of IS and computer services, the LAN lead is shared equally by IS and corporate management, with each named leader at about 31% of the companies polled. At transportation companies and at manufacturers of information technology products, the most pressure for local networking has come from another quarter, business unit management: half of IT companies and 43% of transportation companies report that the greatest interest in LANs has come from business unit management.

And where does this LAN road lead? According to the survey, just over 39% of the installed LANs are connected to corporate mainframes.

In most cases, credit for the creation of all this networking can be laid directly at the feet of in-house IS shops. The survey asks simply, "Who built your network?" and the overwhelming majority—66.6%—of respondents say that they'd built the things themselves. Not completely without help, of course. (Respondents could split the credit, so the answers total just a hair over 110%.) Just over 15% cite major computer vendors. Almost 10% say that their networks had been built by a systems integrator or value-added reseller. The same number of respondents—4.3% each—say a major communications vendor or a telephone company. But outpacing both these traditional networkers is the local PC retailer: 5.4% of the respondents credit these local businesses as their network builders.

This year, over 34% of PCs and over 41% of users at an average site are connected to a local area network.

The survey also reveals much about the shape of computing today. Respondents were asked which connectivity/computing architecture best described their companies. The choices: single-tier, host with terminals; double-tier, host with networked PCs/workstations; triple-tier, mainframe host with mini gateway to networked PCs; networked PCs only; and other.

Closely bunched at the front of the pack were single- and double-tiered solutions, with double-tier ahead by a nose, 35% to 33%. Three-tiered architectures were the rule at 21% of the respondents' companies, with the rest making do with networked PCs or other.

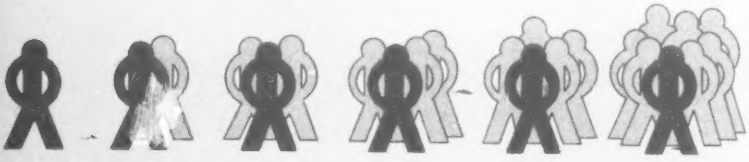
But when a company aims to fully interconnect its computer systems, the balance shifts. At these ambitious organizations, double-tier at 36% and triple-tier at 31% are the clear leaders. Single-tier solutions drop back to just under 21%.

Apparently, the size of the company has a lot to do with architectural realities. Those favoring a three-tier scheme tend to be in companies with more employees, the largest group in companies with more than 5,000 employees.

Who's On-Line?

At companies using Unix, a mean of almost half of all PCs are on LANs; at smaller companies, PCs are more likely to be connected than at large ones.

Company/Organization Size
Number of Employees



Under 50	50-99	100-499	500-999	1,000-4,9999	Over 5,000
27.3	40.0	39.6	41.7	48.0	39.7
–	–	7.6	11.1	8.0	10.4
–	20.0	7.5	8.3	10.0	10.3
9.1	–	7.5	2.8	6.0	1.7
–	–	3.8	8.3	4.0	6.9
–	10.0	1.9	5.6	–	8.6
–	–	7.5	2.8	4.0	6.9
–	–	3.8	13.9	10.0	8.6
18.2	10.0	3.8	–	6.0	5.2
45.4	20.0	17.0	5.5	4.0	1.7
63.6	40.3	37.8	31.4	29.3	31.9

Illustrations by Catherine Francis

Single- and double-tier plans are more evenly spread across the population spectrum, but single-tier dominates in companies with between 50 and 500 employees. Double-tier dominates at companies with fewer than 50 employees and at those employing between 500 and 4,999. (Understandably, the PC-only solution is also most often found in the smallest companies.)

Still, there is much distance between the connectivity ambitions of U.S. companies and the connectivity reality. In a wired world, many lag behind. But there are exceptions. According to the Associated Press, a recent survey of the town of Santa Monica, Calif., found that 23% of the residents owned personal computers equipped to communicate!

The Role of the Technology Track

Connectivity's shape within an organization often depends on the technology strategies that operate within that organization. The survey asked respondents to identify technologies for which they "have technology strategies," and these answers were cross-tabulated with the other findings of the survey. Here are some intriguing findings:

- Those who report they have utilization strategies for the Open Systems Interconnection (OSI) model and SNA are more likely to believe the shift toward end-user computing will displace today's IS pros than those that don't have OSI and SNA strategies. Where respondents on other technology tracks say "No, this won't happen" about 80% or more of the time, only 68% of OSI and SNA types say it won't happen.
- Users with Macintosh strategies are the most unhappy about the connectivity solutions that are available: fully 92% say pieces of the connectivity puzzle are missing. The across-the-board average of those who cite missing pieces is 76%.
- The major problems cited when downloading data for users are user interfaces (cited by 46.2% of respondents); performance (42.6%); and data transformation (40.4%). For OSI strategists, performance takes the negative lead, named as the number one problem by almost 69%.
- Organizations with OSI strategies are the only places in which a majority of workstations are on a LAN: over 55%. Unix strategists come next at almost 43%.
- Users with OSI strategies are also the clear leaders in the average percentage of their PCs that are on LANs: 54%. In no other technology strategy does the percentage of connected PCs exceed 40%.
- Users who aim at OSI are also most likely to have their LANs connected to the corporate mainframe: almost 58% of LANs at OSI strategy sites are hooked to the corporate data center. The mean for all technology strategies is 39%.
- OSI strategists also have the largest percentage of their PC users on LANs: almost 57%. Companies with Unix and MS-DOS strategies lag at about 46%.
- The LAN lead has been taken by MIS most often at organizations with OSI strategies. At companies pursuing other technology strategies, end users have pushed LANs hardest between 20% and 37% of the time; at OSI shops, end users have taken the lead only 5.5% of the time.
- The organizations with OSI technology strategies are the most likely to have installed LANs: more than 83% say they've done so. The mean for all technology strategies is almost 56%.

The Horse's Mouth

A maddening drawback of most surveys is homogenization. The reactions of individuals get whipped into a froth of numbers to render up a smooth, statistical picture of trends. But with DATAMATION's Connectivity Survey, the tale has been told in words as well as numbers. Here are some verbatim comments from the questionnaires.

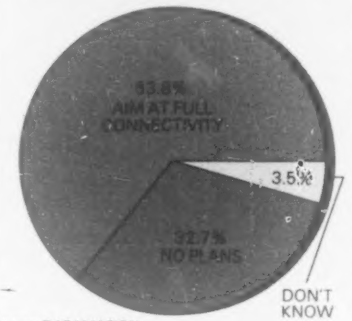
- When asked "What is the most common title of an individual at your organization who is in charge of implementing connectivity solutions?" a respondent eloquently replies, "the telephone repairman."
- Asked to identify missing pieces of the connectivity puzzle, one gloomy user responds, "It will never be complete."
- A director of information systems at a manufacturing company complains that "no true standards exist across the board that adequately address the connectivity of multivendor systems, without extensive customization."
- An IS manager at an oil and gas exploration company doesn't think the puzzle is incomplete, but he does complain about "the amount of memory required on the PC [in order to] connect. It doesn't leave enough memory to run applications. . . ."
- A communications manager at a publishing company sourly notes, "Too many [connectivity products] don't work as announced."
- An IS manager in construction/mining/agriculture can't find satisfactory "remote access to LANs."
- A communications technician at a large communications utility scrawls in large letters what he finds lacking: "STANDARDS!" He adds that SNA gateways purchased by his company have failed to meet his expectations.
- A facilities manager at a large manufacturing company says 'data transformation problems need additional work." But this manager says he has not purchased unsatisfactory connectivity equipment: "My expectations were not high," he explains.
- A manager of micro-information services at a medical or legal services firm is "concerned about the quality and availability of software for gateways."
- A data processing manager complains of "not enough education by the computer vendor, i.e., IBM."
- A manager of computer operations at a large wholesale or retail trade company says, "Yes, even easy-to-use PC packages break down when it's time to import data."
- One network manager/administrator for a large educational institution sees improvement: "Not as many missing pieces [of the connectivity puzzle] as there were two years ago."
- And an IS manager and an analyst should meet.

The analyst: "All the pieces seem to be there. People have just not come up to speed in learning about the potential uses."

The manager: "As confusing as all the different communications products are, no one company or person can possibly know everything there is to know."

The Connectivity Target

At the majority of U.S. firms, the aim is to fully interconnect computer systems.



Source: DATAMATION

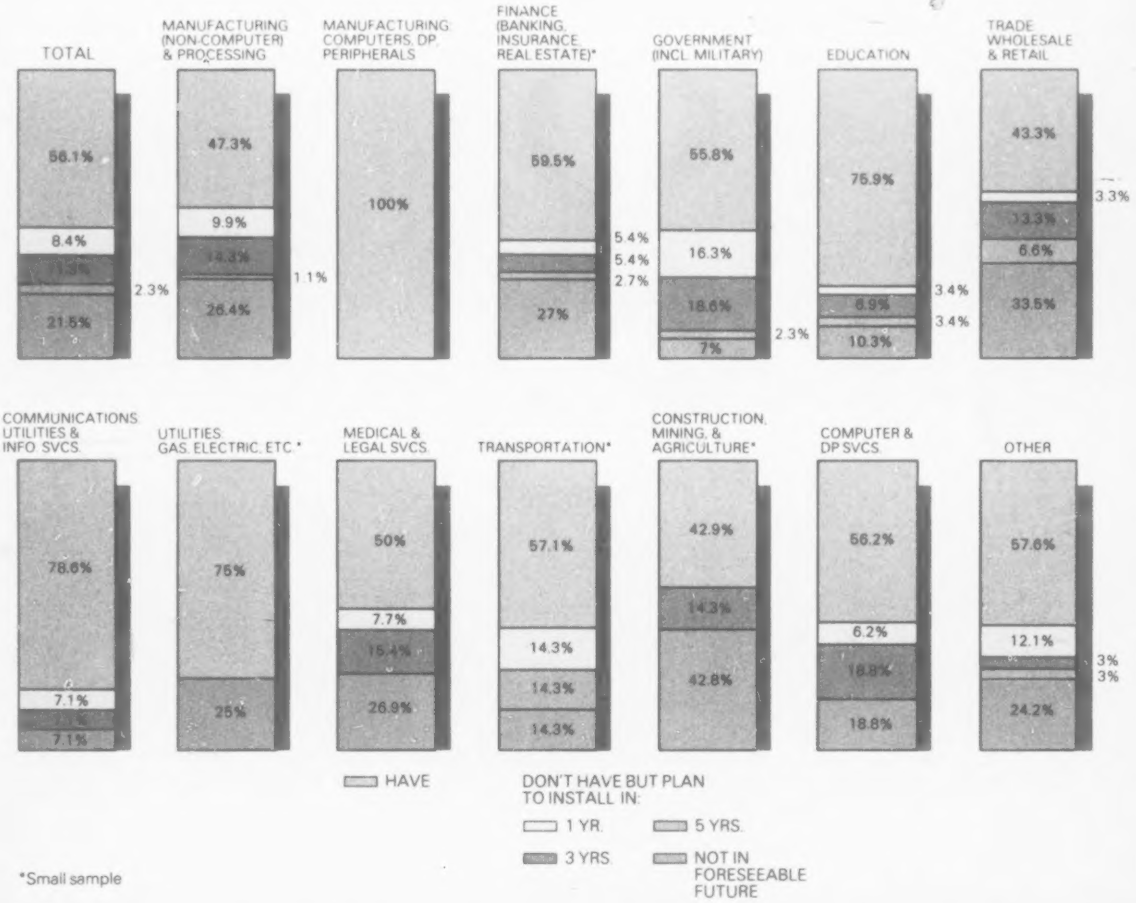
Methodology

On January 17 of this year, 2,000 questionnaires were mailed to a random sample of DATAMATION subscribers. The sample was limited to one name per site for those whose titles are within Computer/Systems Operations Management. Names were selected at a specified interval throughout the list so that a systematic random sample of the entire list resulted. To achieve the highest possible response rate, each outgoing envelope was personally addressed to the recipient and a business reply envelope was enclosed to facilitate return of the completed questionnaire.

By February 15, a total of 351 completed questionnaires had been returned to the Cahners Publishing Market Research Department, indicating a response rate of 17.6%. The results were tabulated and this report was written based upon the data in these questionnaires. Percentages based on a sample of this size have 95% confidence intervals of between two and six percentage points in either direction. That is, in 95 cases out of 100, percentages based on this sample will differ by no more than two to six percentage points from what would have been obtained by interviewing all subscribers rather than just a sample. ▭

The LAN Reality

Local area networks have vastly increased their penetration into U.S. businesses, but some businesses are more wired than others.



*Small sample

Source: DATAMATION

Top Chart by Catherine Francis; Bottom Chart by Paragraphics

FINANCIAL SERVICES

SECTORS

SCAN

Workstations Make Their Way into Wall Street Portfolios

BROKERAGE HOUSES SELECTIVELY EQUIP THEIR TOP PERFORMERS WITH NEW COMPUTING POWER.

The word on the Street is "workstation." An expanding service economy, rising popular participation in the markets, globalization of financial activity, consolidation of and increased competition among financial firms, together with rapidly advancing high technology—all are factors adding up to a furious drive to increase the productivity of traders and brokers by concentrating data and communications power on their desks. How—and whether—the broker/trader workstation is being implemented has not been a source of agreement, however, and so DATAMATION asked a few in the know what they knew:

TURNING TO TURNKEY

NCR is the turnkey vendor of choice for most small banks.

Vendor	Customers	Hardware
NCR	1,106	NCR
Information Technology Inc.	878	Unisys
Jack Henry & Assoc.	502	IBM
Modern Banking Systems Inc.	487	Texas Inst.
Kirchman Corp.	400	IBM
Broadway & Seymour	316	IBM
Electronic Data Systems	289	IBM
Bank Systems Co.	150	IBM
Precision Computer Systems Inc.	150	Unisys
Nicola Banking System	122	NCR

*Commercial banks with assets under $250 million
Source: Computer Based Solutions Inc., New Orleans

John McGeachie, senior consultant at Arthur D. Little, Burlington, Mass.: "The workstations are going to dealers, the big guys, making big deals. Those are the guys who are making money for the firm, by going for a better price. If they have more intelligence in front of them on the desk, they can have the computer scan futures versus current price, etc. Within some set conditions, the computer may even initiate the trade."

Alan Loss, CEO of Asset Management Technology Corp., Marblehead, Mass.: "Workstations are not for brokers serving individual investors. Most of their needs will be satisfied by powerful PCs. Traders and research analysts will have them. Quotron used to be on brokers' desks for stock prices. It was just a dumb terminal. Now Quotron offers an intelligent terminal on your desk."

Pat Sullivan, senior manager at Peat, Marwick, Main & Co., Lexington, Mass.: "It's mostly the big houses that have pilot projects. But all will have to follow. . . . It will give the broker the incentive and the motivation to sell the diverse products that the house offers. If you can offer your customer more than what your competitor is offering, that's what's important. Another thing that firms want to do is retain account executives. If they don't encourage a broker to stay, most often he takes his customers with him."

Mark Sternfeld, managing director at Salomon Brothers Inc., New York: "We'll have trader workstations at Salomon, operations workstations, accountant workstations. We believe a great deal of the functionality can be distributed itself. But people jump to the wrong conclusions when they hear 'workstation.' Not every accounting person is going to get a $50,000 workstation with CAD/CAM."

DATAMATION's budget survey shows financial firms will devote 2% of their budgets to workstations this year. ◀

Agents Network

This month and last, the National Association of Independent Life Brokerage Agencies (NAILBA) has been hearing presentations from firms eager to do for life insurance what has been done for the airline industry: give it a data communications platform linking agents with service providers. By connecting their computers to those at insurance companies, the system would allow independent agents immediate access to product information and case status, direct entry of applications, and even electronic transmission of commission payments.

The leading candidate to supply the service, which would send data over the Insurance Value Added Network System, is Multidata Corp. of San Jose.

A decision by NAILBA is expected this summer. ◀

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Editor: Linda Runyan
Scan Writer: Eric Brand

Accuracy Counts

Two years ago, SunBank/South Florida NA hired some help to count currency and separate out "fit" notes for its ATMs. They counted thousands of bills a day, rarely made a mistake, and never embezzled. So SunBank hired seven more members of their family—the Toshiba-based Mosler currency processing system family—and now the machines are busily processing 800,000 bills a month.

Mosler processors count Florida dollars accurately.

Paula Hertzer, senior vp at SunBank, is ecstatic. "It's very unusual for equipment to be able to sort for denomination, suspected counterfeits, fitness sort—and be accurate!" she says. Sold by Mosler Inc., the system is based on Toshiba CS-6600s and CS-400s and uses Mosler software.

"Prior to the purchase of the Toshiba machines, we did a manual counting of the deposits of our corporate accounts," explains Hertzer. "We had a very small vault capacity, as far as space for people, for bodies. We looked for a way to provide the most efficient service possible for our customers without spending a lot of money." Having found it, she says, she also found that the bank "can continue to take on new customer accounts without increasing staff. The machine just works a little longer each day."

Defalcation (bankspeak for stealing from the till) is, of course, a nonconcern with a nonhuman money-counter. In fact, the system has a snitch feature to guard against all-too-human temptation. "The machine actually will lock out the operator if the deposit is out of balance, and will call the supervisor," says Hertzer. She notes, however, that the feature is unnecessary: "We pride ourselves in having few losses in our cash vault processing anyway." ◀

Futures Traders Spar

The scratch-yer-eyes-out grudge match between Chicago's two futures exchanges has gone overseas, following a federal investigation, introduction of rival products, and the development of competing automated trading systems. The last are seen as the ticket to admission into foreign futures exchanges, where many see the battle for survival shaping up.

The Chicago Mercantile Exchange is developing Globex jointly with Reuters Holdings plc. Globex is designed to be a worldwide trading system that will post and match bids and offers. The Chicago Board of Trade is developing an automated auction market system that would actually replicate the pit open-outcry system.

Both exchanges are pushing their systems hard on the world market. The Marche a Terme International de France and the Sydney Futures Exchange have signed on to Globex, and now the London International Financial Futures Exchange (LIFFE) is being courted.

Roger Barton, director of technical services at LIFFE, considers the alternatives. "Both the Merc and the Board of Trade are large exchanges and they're both technically very competent," he observes. "So there's advantages to working with both of them. We're quite new—only seven years old—so their resources are very large compared to LIFFE."

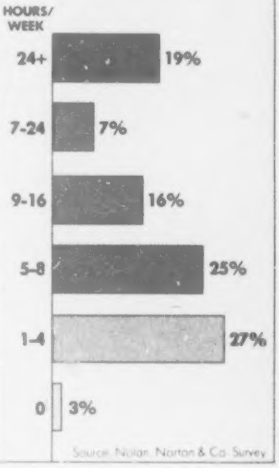
A hookup therefore might mean access to valuable technical experience. But whereas Barton feels that, philosophically, LIFFE is "very close" to the Board of Trade, especially in its approach to an automated trading system, Globex represents participation in a worldwide system.

One consideration, according to Barton, is to prevent being locked into a technology by any cooperative agreement. "Our technical architecture is very open," he declares.

"For example, our automated trading system, workstations, clearing systems are based on DEC, IBM—we have quite a mix. There's no particular bent, and we'd like to keep it that way." ◀

TAKING STOCK ON SMALL SYSTEMS

Brokers are doing more business on personal computers.



Source: Nolan, Norton & Co. Survey

The London International Futures Exchange and other foreign markets are key.

Andersen Sees Fewer Slices in Bigger CSI Pie

The computer systems integration market will get simultaneously bigger and smaller, according to Arthur Andersen & Co. That's anything but confusing to John Altman, director of Andersen's worldwide systems integration practice.

The CSI market is expected to triple by mid-decade from its current $17 billion size. "Our goal," says Altman, "is to be about a $5 billion consulting business by the mid-1990s, and maybe $10 billion by the end of the decade. I believe that our partners and our people are extremely fired up by that objective." With Andersen's current CSI revenues pushing $1 billion, that's a five- and tenfold increase, respectively. That explains the "bigger" part of the equation (not to mention the partners' enthusiasm). But the "smaller" part is hard to figure out.

Altman targets $5b CSI goal.

"Clearly, we believe that this is a marketplace that is going to consolidate," says Altman. "There are not going to be a large number of people that can do systems integration. Over the next several years, there are going to be very few survivors."

Though the defection of several top partners and managers last year generated a lot of press, Andersen still sees itself as one of the survivors—to say the least. A major restructuring, assuaging the firm's consultants by shifting its emphasis from taxes and audits to consulting, was a tremendous move, says Altman. "One of the reasons is that all the partners will benefit from the success of Andersen Consulting."

That unity will be crucial to Andersen's success if it's to fight off competitors for the big CSI contracts. With its head start, the chances are getting smaller that Andersen won't get bigger. ◀

Home Banking Is Not Pronto

Chemical Bank's Pronto just never caught on.

How'd you like an automatic teller machine dispensing cash in your living room? It looks like that might be the only way for now to sell home banking. Frank Faeth, vp in consumer banking and director of planning at Chemical Bank, points out, "Given the cost, you wouldn't pay a thousand dollars to keep your recipes and balance your checking."

Chemical should know. It spearheaded home banking with its Pronto program in 1983, but business was never brisk enough to recoup investment. Although a joint venture was established with AT&T in 1985 expressly to market it, Pronto was dead as of January 1989.

Pronto did not die lonely. "A lot of banks are considering the financial viability of their programs," says Faeth. "I think you're going to see banks focusing their businesses. If programs cannot pay for themselves or cannot demonstrate strategic importance, I think those programs will just go away."

Although he refuses to make a projection for the home banking market, the Chemical executive is still optimistic about it. He cites as a possible harbinger for the future the Prodigy Interactive Personal Service from IBM and Sears, which provides information, shopping, banking, travel reservations, and communications on a home personal computer. "Look at the Discover card and the IBM PC," says Faeth, referring to the popularity of Sears new credit card and IBM's machines. "You've got to think they know what they're doing."

Faeth foresees a time when every home will have a comprehensive electronic link to the world, and banking, shopping, learning, viewing, and the like will be done from one convenient Lazyboy. But, he says, "you really have to prove to someone that it's worth it to change their behavior." ◀

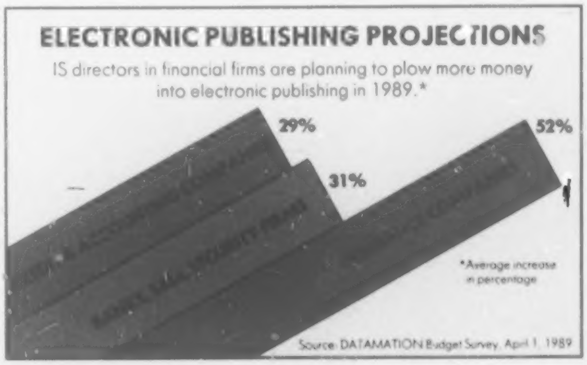
Post-Crash Wall Street IS Spending

With a year and a half between it and the Crash of 1987, Wall Street is shelling out its dough for information systems cautiously. "The period from 1983 to 1987 was one of extreme rapid growth of spending on dp. That ended with the crash," notes Mark Sternfeld, managing director at Salomon Brothers Inc. in New York. "In the subsequent period, it was probably half that—maybe less, zero to 15%. This year, it has edged up a bit."

The expenditures go to bread-and-butter processing. "The [funds for] artificial intelligence kinds of applications, relative to large systems budgets, is immaterial," says Sternfeld.

The Salomon executive believes that the most important determinant of IS allocations is where a user is in terms of the available technology. "Different firms have different cycles," he says. "You're in a technology for a decade and a half and then you change it for another one. The large investment banks—there are five or six of us—spend about 12 years in a technology, and six years migrating.

"We are going to be investing in a fundamental change in our processing, from a mainframe-based environment to a distributed environment. Those firms that have had this change already will be spending some of this money in delivering this technology to their end users." ◀



ELECTRONIC PUBLISHING PROJECTIONS

IS directors in financial firms are planning to plow more money into electronic publishing in 1989.*

*Average increase in percentage

Source: DATAMATION Budget Survey, April 1, 1989

A CAHNERS PUBLICATION

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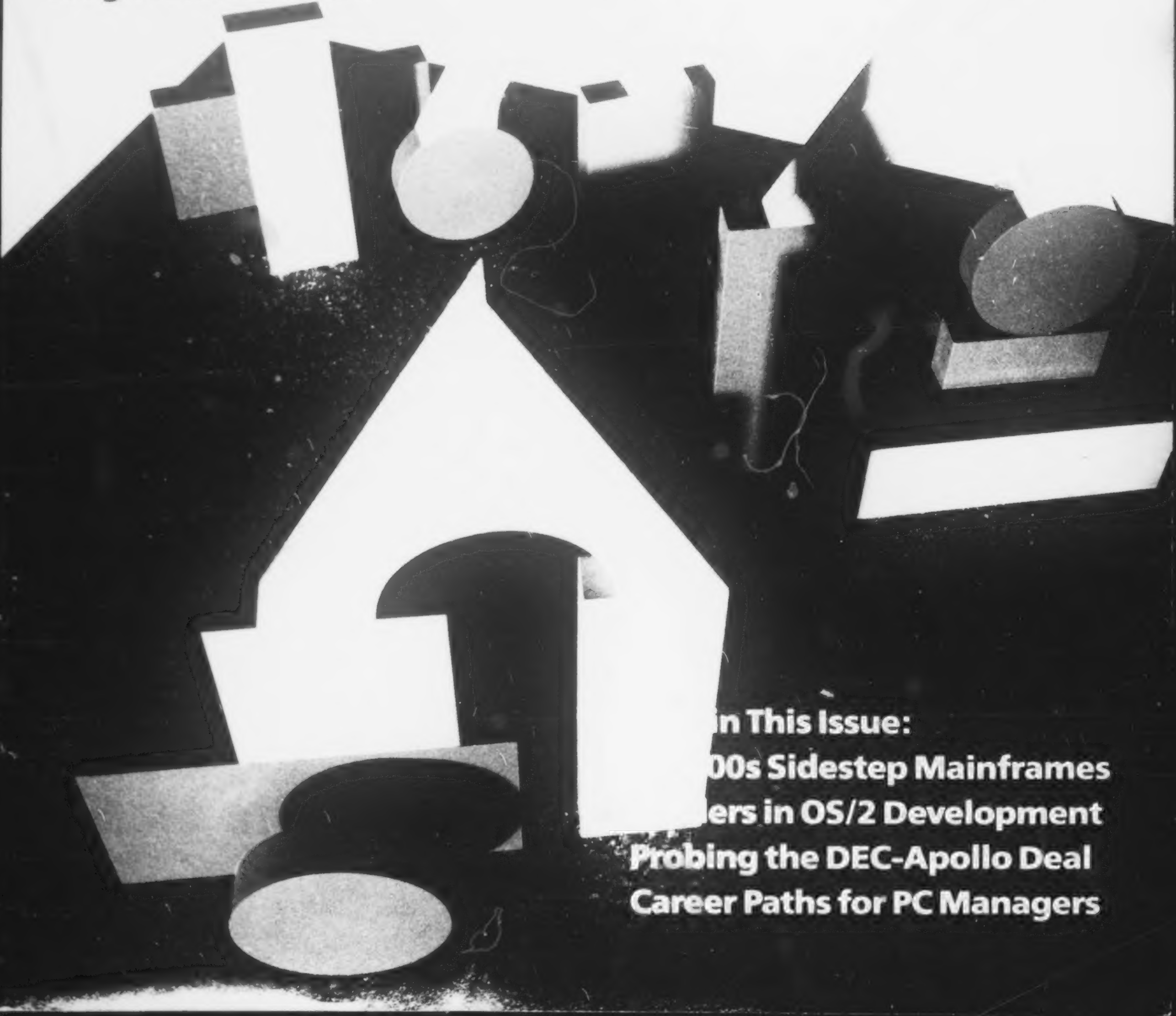
MAY 1, 1989

SPECIAL

DATA

Integrated Computing Environments

New Architectures Take Shape, but Tough Choices Loom



n This Issue:

00s Sidestep Mainframes

ers in OS/2 Development

Probing the DEC-Apollo Deal

Career Paths for PC Managers

MAY 1, 1989

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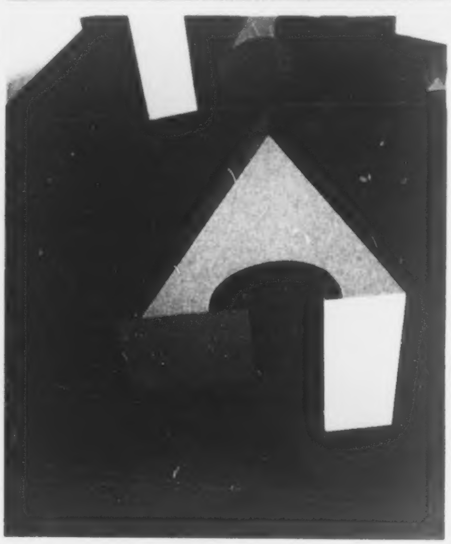
NUMBER 9

DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE



Integrated Computing Environments 18

BY GARY McWILLIAMS A new generation of application development architectures is popping up all over, but few users expect a [illegible] multiple computing environments to emerge. The appearance of what some are calling integrated computing environments (ICEs) holds great promise for tying together disparate systems. But with the advent of so many environments, users may be facing a difficult choice in the months ahead.

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Cover Photography by Curt Berner

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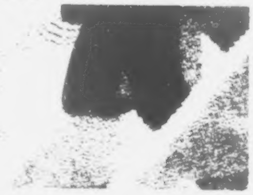

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Climbing the PC Ladder 77

BY BOB FRANCIS Microcomputer managers are beginning to discover that career advancement depends on more than just PC skills. IS and business knowledge are musts. So is working at a corporation that is committed to desktop technology.

INTERNATIONAL

Special supplement not included in all issues 80-1

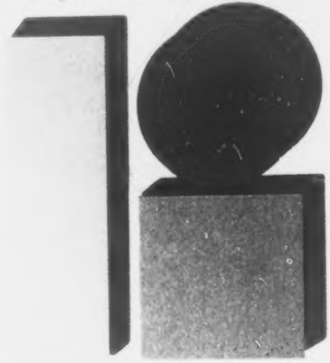
Building a Better Environment

Productivity has long been the name of the game in running IS operations. From the first commercial computer installations of the 1940s to the massively complex systems being erected today, IS managers and their harried staffs of analysts and programmers have worked to get more from their machines.

Suddenly, however, vendors and managers of information systems are finding a new source of improvement. It's not within the computers themselves, but rather what lies outside of them: the environment. Not the larger environment as you and I know it, but the organizational and technical infrastructure within which you manage your employer's information resources.

The discovery is far more important than most realize, and it's occurring in many more ways than people understand. This issue of DATAMATION, for example, contains one obvious environmental report, our cover story. But careful examination of other stories—on topics as diverse as OS/2, the AS/400, object technology, and networks—reveals that users as diverse as Big Eight firms and bakeries are singly focused on one objective: creating environments, defined by computers and continents, that will enable their enterprises to grow more productive.

In "Integrated Computing Environments," p. 18, Section Editor Gary McWilliams confronts the issue head-on, carefully examining the new environmental offerings of major IS suppliers and the reactions of users to them. The goals of creations like AT&T's Application Operating Environment, he writes, suggest an impact that reaches outside the IS department. Consistent behavior across operating systems, common programming interfaces, and distributed operation—the most often-stated goals—portend change for how developers approach software design and how users interact with a system.



CREATING PRODUCTIVE environments is a major IS challenge

Predictably, in an age in which customers seem to know more about their suppliers' business than the suppliers themselves, McWilliams encounters several users that already are building their own parts of the brave new worlds of computing.

Construction of a similar sort is under way at some of the leading PC/workstation suppliers and general systems companies, according to Dallas Bureau Manager Bob Francis in "Who's on Deck with OS/2," p. 45. Compaq, Dell, Sun, NCR, HP, and others have assigned crews of software developers to build real products out of the promises of the OS/2 environment. Most see the second generation desktop operating system as the means to serve their customers' more sophisticated applications needs better than they can with DOS and, in some cases, Unix.

Environmental changes are sweeping across the other tiers of computing as well. Notably, several IBM mainframe shops are embracing AS/400 midrange systems as an alternative to further S/370 investments required by new application demands. In "The AS/400's Surprise Role," p. 49, author David Stamps measures the gains in productivity that users such as Pepperidge Farm and Arco realize by expanding beyond their S/370 worlds into AS/400 domains. Similar improvements are expected by customers of Digital and Apollo in the wake of their joint announcement to codevelop a networking extension to Apollo's remote procedure call. Leila Davis's article "From WANs to LANs," p. 73, captures how ecstatic users like those at the University of Iowa are at the prospect of being able to tie remote computing resources to workstations at the school via RPC.

These articles should convince you that building a productive systems environment is a tangible objective. Environment, in fact, may be the new name of the IS game.

Tim Mead

Tim Mead, Editor-in-Chief

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Japan Prepares for Software Crisis

With the prospect of a million too few software engineers in Japan by the year 2000, industrial companies and the government have begun widespread software research and retraining projects.

BY STUART M. DAMBROT

It's taken for granted that the twenty-first century will be an age of pervasive computerization, global telecommunications, and widespread automation. Still being debated, however, is the question of dominance: will the future belong neither to the militant nor the meek, but rather to the technologically advanced? If the latter, Japan stands a good chance of becoming the world's leading economic force.

Japan's technological prowess is not ubiquitous, however. As a matter of fact, Japan has a major weakness: software. Not only is the West regarded as having superior software capability, but Japan also has a rapidly escalating shortage of software engineers.

In an attempt to overcome problems in the areas of software productivity, development, and incompatibility, the Japanese Ministry of International Trade and Industry (MITI) is applying proven manufacturing automation techniques to the software design process. Its Software Industrial Generalization & Maintenance Aids (SIGMA) project is a five-year, $194 million (¥25 billion) effort to automate software development and create standardized Unix-based data structures, communications interfaces, and applications platforms.

But what about major Japanese companies—what are they doing, and planning to do, about this looming software crisis that threatens the future of their internal information processing systems, user services, and overall productivity? Are they interested in the results of the SIGMA project, but perhaps unwilling to pay for expensive SIGMA workstations?

The answers differ from company to company, but there is an underlying sense of optimism. In general, the following tactics will grow in importance:

- retraining of existing employees;
- contracting out of software projects;
- implementing structured programming aids; and
- automating programs.

MITI, which predicted the programmer crunch in the mid-'80s, expects that by the year 2000 Japan will need 2 million software people to handle increased programming requirements, but that it will only have 1 million of them (see "Japan's Software Skills Crisis").

This shortage projection is based on anticipated program volume, or lines of code. According to MITI, the man-hours required to generate this code will increase faster than the number of available programmers.

In rising to meet the challenge, Japanese companies differ as to the ways they plan to compensate for the projected crunch, but they all subscribe to the same official position. While admitting that MITI's depiction of coming trends is accurate and allowing that they will notice the consequences in their internal programming departments, they maintain that they won't really be affected.

After all, they point out, the Japanese government and industry are not at odds with one another. MITI is on their side, and so the advance warning its projections afford is welcome; it gives them that much more time to plan. They also can anticipate government assistance in the form of projects like SIGMA.

Sadao Maeda, senior manager at the Engineering Strategy Planning headquarters of Nippon Telegraph and Telephone (NTT) in Tokyo, feels that "from MITI's viewpoint, the volume of software that must be developed will be increasing, but that from NTT's point of view, the shortage won't be that serious. "For one thing," Maeda explains, "we're increasing the number of university graduates we're hiring as programmers. Many young engineers would like to join NTT."

Kiyonori Konishi, also a senior NTT manager, adds, "There are now 280,000 employees at NTT, and a large number are engineers. We're planning to retrain many of these employees as programmers." The giant telecom firm will also increase the software development work done at its subsidiary, NTT Data Commu-

Illustration by Scott A. MacNeil

Sumitomo Workers Learn New Skills

Sumitomo Metal in Tokyo has taken a very precise approach to retraining employees. Its blue-collar workers are trained for six months and are redeployed as programmers, while its white-collar staff members study for one year to become higher-level software engineers.

"At this time," says systems engineering assistant general manager Susumu Misago, "there are about 200 retrained programmers on the job—roughly 20 graduates from each six-month class since the program started two years ago. There are also 10 reeducated systems engineers; classes began last year, and only 10 employees complete the 12-month course each year."

One key to Sumitomo Metal's system is the integrated set of structured programming aids developed for use in all phases of software development. Standard forms are used for each step, from high-level design through coding, data structure specifications, and screen layout. Programmers work from statements generated by software engineers, limiting the options available to them and thereby further reducing coding time.

In addition, Sumitomo uses guidelines to determine which employees—at what age and at which point in their careers—are best suited for particular responsibilities. Three employee groups—23 to 32 years old (up to 10 years with the company); 33 to 42 years old (10 to 20 years with the company); and over 42 years old (over 20 years with the company)—are correlated with the categories of software engineering management, software engineering innovation, software engineering applications systems development, software programmers, and programmers limited to standardized coding procedures.

Each matching of group to category is rated according to average employees' ability to perform that job. "For example," explains Misago, "innovative ability is seen as being optimal for ages 23 to about 38, acceptable from 39 to 45, and declining after that point. On the other hand, employees are not even considered as potential managers until they are at least 33, but are deemed able to perform well throughout the remainder of their careers."

Such a standardized retraining system isn't for everybody. What makes it possible in Japan is the highly uniform nature of Japanese society and business practices.

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nications, according to Konishi.

This is the same strategy that has been adopted by NRI & NCC Co., a recently (January 1988) merged subsidiary of, and provider of information services to, Nomura Securities. NRI & NCC plans to offset the coming shortage largely by developing more software through outside contractors, as well as by continuing to purchase software packages. Meanwhile, Toshiba augments its subcontracting by transferring internally developed software tools to its outside developers, which then employ the tools in preparing code for the company.

A number of Japanese firms have developed internal computer-aided and automatic programming technology to help them overcome the lack of software personnel. Nomura's NRI & NCC, for instance, has several systems it uses to increase programming productivity at different stages of the software engineering cycle, and it is "looking to purchase a good CASE system," says Shintaro Maeda, NRI & NCC spokesman.

CASE tools will be used in the design phase, which NRI & NCC defines as business analysis, conceptual design, and basic design. For the past seven years, NRI & NCC has been using computer-aided structured programming (CASP)—a limited type of CASE system developed by the company—during the programming phase (program design and subsequent coding) and for testing and debugging.

"With CASP," says Shintaru Maeda, "programmer productivity has increased from an average of 1,000 to 1,500 lines of code per month to 5,000." During the programming phase, another NRI & NCC tool known simply as G (for graphic system) automatically converts programmers' flow charts into COBOL code. Finally, another internally developed tool known as the Integrated Workbench (IWB) is used during testing and debugging.

In NRI & NCC's software development network, a variety of workstations and mainframes connected in a ring-topology LAN communicate over optical fiber. Included in each LAN are a number of manufacturers' SIGMA workstations being used on a pilot basis in tasks ranging from program design through installation. Software engineers are now developing an Operation and Maintenance System (OMS) for postinstallation use and have as their overall goal the integration of these now separate software productivity tools under their Information Technology Project (ITP).

However, Toshiba has by far the most substantial and ambitious software productivity enhancement effort under way. Its Systems and Software Engineering Laboratory is heavily committed to a 17-year project for developing IMAP (Integrated Software Management and Production Support System), a system designed to advance industrial software production. Toshiba plans to achieve this so-called industrialization of software production by three means: consistent production quality based on reusable software modules, automation of management functions, and an integrated production system.

IMAP's Next Step

"The IMAP project began in 1983," recalls Ikumune Takahashi, senior research manager at Toshiba, "and we are now internally promoting its use." This second phase of the project is called Step 90, since it is scheduled to be completed by 1990. At that point, IMAP will be upgraded to incorporate user feedback and advanced technologies, including design application AI, software engineering knowledge bases, and greater degrees of "hidden programming"—that is, more powerful man/machine interfaces and greater user friendliness.

IMAP consists of four components:

- life cycle (conceptualization, design, production, integration, and system analysis);
- supporting tools (reusable components, development aids);
- environment (technical support, database); and
- management system (cost control, quality control, technical management).

IMAP is being targeted for use on engineering workstations in a distributed development environment, i.e., an arrangement something like NRI & NCC's software and development network. Toshiba estimates that IMAP will prove useful in 90% of the effort expended in developing application software for control, factory automation, engineering automation, and other microcomputer areas.

MITI, meanwhile, is not sitting still. As SIGMA enters its final year and its systems are evaluated, two follow-up projects are being readied to begin in fiscal 1989. SuperSIGMA, a five-year extension of SIGMA for which MITI will reportedly request $775,000 (¥100 million) in first-year capitalization, will continue to develop interfaces for incompatible computers. Specifications for a standard operating system will also be devised, and the application of AI and expert system technology to automatic programming will be investigated.

The details of SuperSIGMA will depend on feedback from 80 users now testing the

Japan's Software Skills Crisis

By the year 2000, Japan's MITI predicts, over 2 million software engineers will be needed, but only 1 million will be available.

YEAR		1985	1990	1995	2000
Demand*	Software Engineers	182	327	536	828
	Programmers	289	520	853	1,328
	Total	471	847	1,389	2,156
Available*	Software Engineers	165	220	296	406
	Programmers	263	376	580	774
	Total	428	596	876	1,180
Shortage*	Software Engineers	17	107	240	422
	Programmers	26	144	273	554
	Total	43	251	513	976

*In thousands
Source: MITI, Machine Information Industry Bureau, Tokyo.

SIGMA prototype workstation, according to Akio Ohnishi, deputy director of MITI's Software Industry Division. Ohnishi points out that with 189 companies involved, SIGMA is "the largest standardization effort in the world, as well as the first to produce actual hardware and software."

The other follow-up project (as yet unnamed) will be conducted jointly by MITI and the Ministry of Labor. Regional centers will train qualified local citizens as software engineers, while simultaneously promoting the SIGMA standards.

Over the next 10 years, some 100 centers will be established either as joint ventures of the public and private sectors or as nonprofit organizations. The estimated development costs are a whopping $2.3 billion (¥300 billion), with first-year budgetary requests coming roughly to $194 million (¥25 billion). The government intends to train 200,000 extra software engineers this way.

No Crisis To Come, Say Some

It all sounds very impressive—but in the end it may not be necessary. By the turn of the century (the time when the programmer shortage is expected to reach its peak), new computer architectures and software engineering tools may reduce the need for these measures.

Casio Computer Co., for example, has reportedly successfully tested a prototype of its Automatic Data Processing System (ADPS), which it says does not need software. ADPS preprogrammed hardware is driven by codes that are input with the data to be processed.

Some industry observers feel that such an outcome is a strong possibility. Masanori Moritani, senior researcher at NRI & NCC, anticipates that by 2000 computer hardware "will have changed drastically, and the projected shortage will by that time be based on what has become an old concept. In the future," he argues, "mainframes will not be needed; they will be displaced by 32-bit microcomputers." Nevertheless, he concedes that "SIGMA is a useful concept," because "it will allow programmer productivity to increase rapidly" even if the shortage does not actually materialize. Such an increase will be urgently needed in the coming years before the advent of the era of full-fledged automatic programming. ▭

Stuart M. Dambrot is a freelance journalist based in Tokyo.

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Supplier Performance Update: Flatter Sales in '89

No upturn in computer and communications equipment sales seen until 1990. Result: A buyer's market in '89.

BY MADELINE FRANCHI

United States-based manufacturers of information systems watched new orders mount in 1988 during the improved business and investing climate. By year-end, new orders reached $107.2 billion, a climb of 8.6% on top of the 7% hike in 1987.

Of course, the rebound in new orders translated into heightened shipments activity. U.S. factory shipments of information processing systems reached $107.3 billion in 1988—a rise of 9.4% from the year before. That represented the best annual growth since the 18% increase back in 1984.

But even before we turned the corner into 1989, growth in new orders had slackened. Witness the declining quarterly growth rate. In the first quarter of 1988, new orders advanced 11.7% over the level recorded in the first three months of 1987. Over the course of the year, however, quarterly gains weakened so that orders in the final quarter grew just 6% from the year before. Growth continued, but at slower rates—a sure sign of business contraction.

Shipments growth will be following suit, posting only a minimal rise in 1989 before turning around again in mid-1990.

The two factors that helped boost sales in 1988—business investment and exports—are precisely the sectors dragging down growth rates in new orders and shipments of information systems in 1989. In 1988, U.S. business purchases of computers and office equipment ballooned 24% to a total of $102.2 billion on a constant 1982 dollar basis, while purchases of communications equipment advanced just over 5%.

With the bulk of the buying now over and interest rates on the rise, however, investment in new equipment will take a rest. Purchases of computers and communications equipment are expected to increase again, but by a slower 3% to 4%.

In international trade, the depreciating greenback boosted U.S. exports of computers and telecommunications equipment in 1988. According to U.S. Commerce Department data, computer and office equipment exports expanded 24%, while telecommunications exports skyrocketed 27%. Exports are expected to increase again in 1989, but the rise will be less than a third the strength of last year.

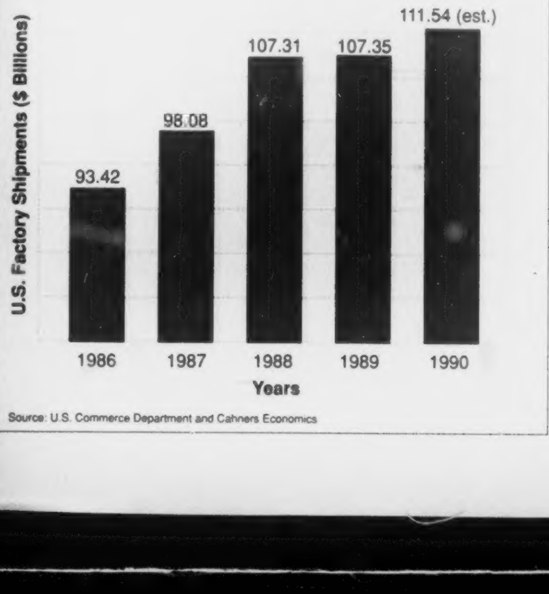
The signing of the U.S.-Canada Free Trade Agreement is a gain to American computer and communications equipment manufacturers. Canada is second only to the European Community as a destination for U.S. electronics products, particularly computers, office machinery, and data processing equipment. However, forecasts say that growth in the Gross Domestic Product in Canada will slow in 1989 from 1988's pace. This may thin north-of-the-border export gains in 1989.

During this slower growth phase, IS vendors are likely to maintain even tighter control on quality and customer service than before and to review and adjust prices. So if you are in the market to buy information processing equipment, this year might be a good time.

More economic information can be obtained from Cahners Economics Department, 275 Washington St., Newton, MA 02158, (617) 964-3030.

U.S. IT Shipments Flat for 1989

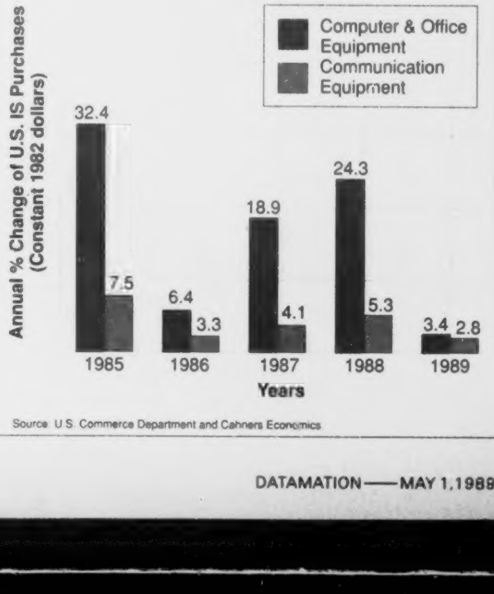
No growth suggests 1989 could be a year in which buyers can get good deals from U.S. suppliers.



Source: U.S. Commerce Department and Cahners Economics

U.S. Buyers Trim IS Plans

After a booming 1988, 1989 doesn't look good for IT sales.



Source: U.S. Commerce Department and Cahners Economics

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TECHNOLOGY FORUM II: Open Systems

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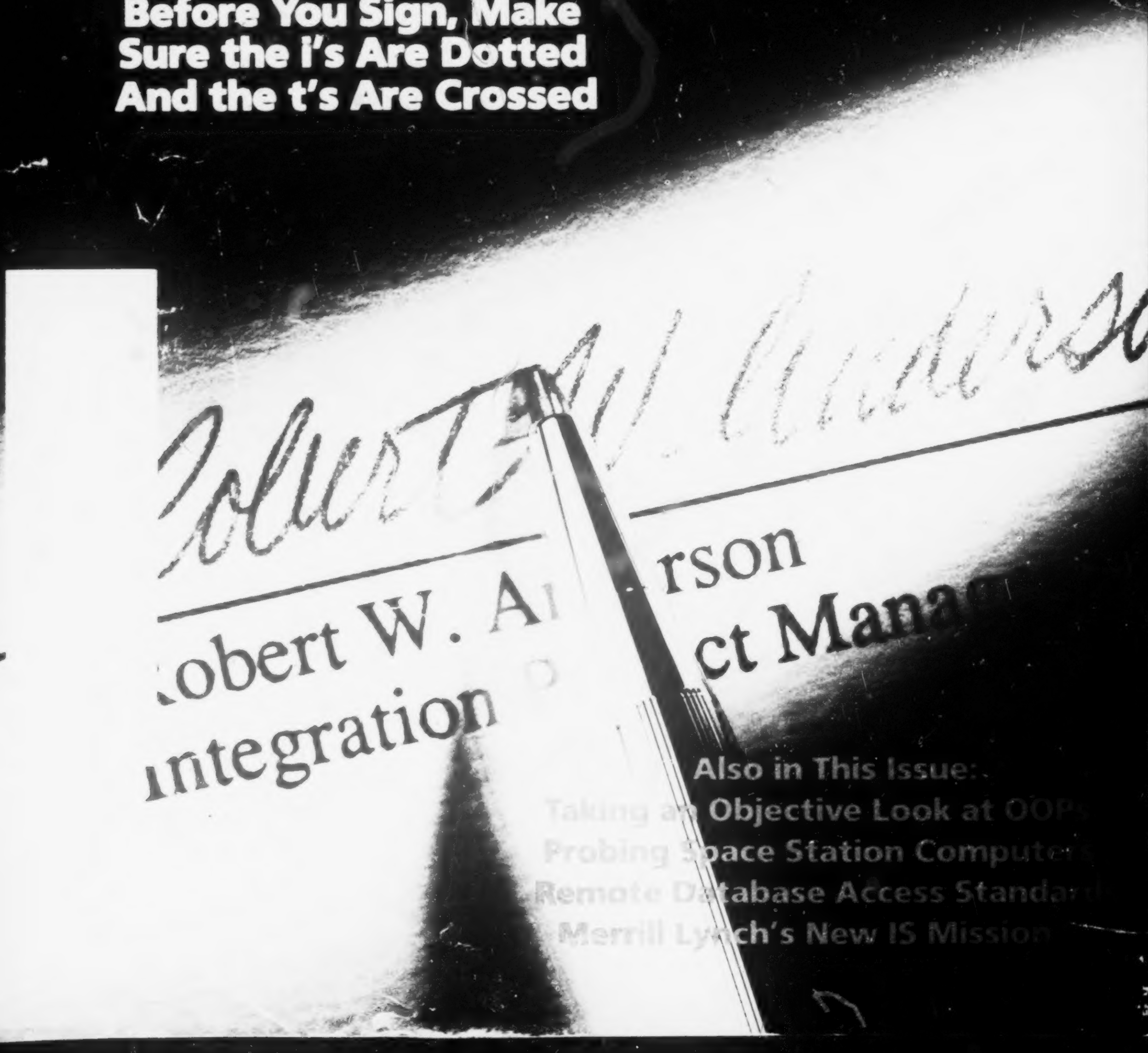
Contracting With Integrators

Before You Sign, Make Sure the i's Are Dotted And the t's Are Crossed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MAY 15, 1989

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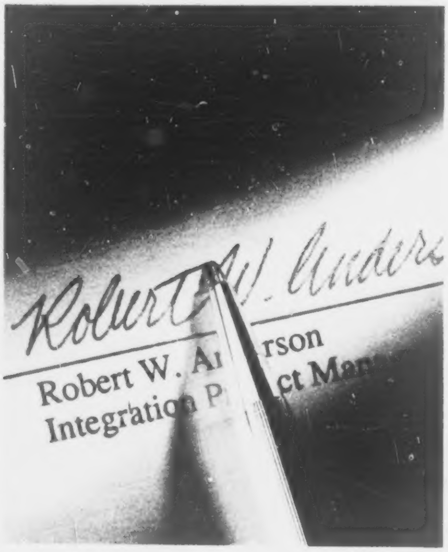

Contracting With Integrators 18

BY JEFF MOAD IS organizations in commercial companies are increasingly relying on outside systems integrators for development projects. But many users are still unskilled in dealing with these outside firms and in devising both requirements and contractual agreements. Much is at stake, though, and some disputes have resulted in awards for damages totaling millions of dollars. Users can protect themselves if they follow a few practical steps.

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BY JEFF MOAD A standard protocol for accessing remote databases may be nearing the end of a long journey through the standards-making process, but will it be implemented?

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EDITED BY LINDA RUNYAN A report on products, services and methodologies for IS managers in manufacturing businesses. Future editions will serve managers in the financial services and government sectors. (Not included in all issues.)

INSIDE DATAMATION

Dealing From a Position of Strength

For many information-processing professionals, the activity known as systems integration is not new: various forms of integration have been practiced for decades, from simply putting together a system in house to implementing big government projects handled by companies specializing in this work. But what is different—maybe even new—today is the extent to which systems integration is being practiced in the commercial world. IS managers in every type and stripe of commercial business are concerned with getting their corporate computing resources moving in the same direction. Standards, cost effectiveness and commonality are uppermost in their minds.

Between desire and fulfillment, there is still a considerable distance to be traveled. And, as senior writer Jeff Moad explains in this issue's cover story, "Contracting With Integrators," IS managers are finding out just how long a trip it is, as well as how many obstacles lie along the road. For a variety of reasons—such as shrinking internal development resources due to cost cutting and decentralization—IS managers in the private sector are looking to outside integrators for help. For many, dealing with outside integrators is a new experience and one that can produce mixed results.

"Many are feeling their way along, getting on-the-job experience and, in some cases, learning from their mistakes," Moad writes. "Often . . . the mistakes are few, and the results are positive. Sometimes the mistakes can lead to disastrous results for user and integrator alike."

The message is that you, the consumer of systems integration services, must take an active and constant role in managing both integration projects and the companies providing services. Know your requirements, hammer out a contract that specifies what's to be done— and when—and understand the relationships among parties involved in the project.

Photograph by Matt Bavoni

JAMES RIVER's PIASCIK is an example of an IS chief dealing well with systems integrators.

To deal effectively with outside integrators, users need to be in a position of strength. Our article in this issue can provide some solid recommendations for how to develop the necessary muscle.

While Merrill Lynch's information system may not have been broke, it certainly was in need of some improvements, as former DATAMATION editor John Kirkley writes in "No Magic, Just Hard Work," page 67. Merrill Lynch's corporate MIS division, which handles the company's core financial software systems, created some new and very creative job titles and system operation guidelines to achieve an overhaul of its systems. The result, as Kirkley points out, has been faster report generation, faster application development and a more decentralized operation.

Technology Forum: Open Systems

Our second Technology Forum, this one on Open Systems, appears in this issue beginning on page 25. Senior editor Linda Runyan has put together a package of stories on this very current, and controversial, subject that will put into perspective what open systems mean for IS users. Just how is open systems defined? What are the consequences of open systems for your organization? How do you migrate from a proprietary system to an open system? Many questions. Many possible answers. Much debate in the Forum. We urge you to join in.

David R. Brousell, Executive Editor

DATAMATION

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Taking an Objective Look

Vendors and early adopters are purposely taking their time exploiting and exploring object technology. They want to be sure it delivers on the promise of improving application development.

BY DAVID STAMPS

Object-Oriented Vendors

Just a few companies singularly focus on the market

Company	Products	Description	Circle
Graphael	Gbase	Database manager	100
Innovative Systems Techniques	Vision	Financial software	101
Ontologic	Vbase	Database	102
Servio Logic	Gemstone	Database	103

Source: Company reports, DATAMATION

Two years ago, object-oriented languages and programming environments were being billed as the next great IS productivity tools. Using such technology, vendors promised, would increase programming productivity not by a mere 10 to 15%, but 10- to 15-fold.

Object programming—which lets software developers and users write programs by assembling modular blocks of routines and procedures rather than stringing out thousands of lines of linear code—was also lauded for other potential benefits. Chief among them was the ability of programmers to design large, complex, highly interactive systems that are nearly impossible to build and maintain using today's structured techniques.

Not all of those bold predictions have been fulfilled. "There's a whole set of fundamental requirements that are lacking: tools, access languages, fourth-generation languages, data backup and recovery," says Jonathan Eunice, a manager for Tarrytown, N.Y.-based market researcher D.H. Brown, in explaining why object technology hasn't reached the takeoff stage. "Today's object database vendors are small start-ups with just barely enough resources to build their basic product and put together some semblance of sales organization," he says, referring to such companies as the not-ready-for-prime-time players.

Yet enthusiasm for object-oriented software has never been higher. Some experts even go so far as to use the word *passion* when describing the techology (see "The Object of Desire," May 1, 1988, p. 37). The concept has enormous appeal because object languages and tools hold the potential to enhance the performance of professional programmers and to let nontechnical people create some of their own programs. That would solve a problem that other hoped-for solutions—fourth-generation languages and information centers—have failed to alleviate: the chronic backlog of applications.

Major systems vendors are beginning to include mention of object features in their products. Conferences on the subject are springing up. Companies are even starting to invest modestly in the technology, though several interviewed by DATAMATION caution that they're merely experimenting with it.

"We're looking at it with some interest. But a lot of things have to happen before it becomes the sort of software you would bet your business on," says David Tryon, systems analyst and methodologist for Pacific Bell in San Ramon, Calif., citing reliable systems development methodologies and robust relationships to databases as two areas of needed improvement.

"We're strictly in the evaluation mode," says Michael Viste, senior development engineer in Allen-Bradley Co.'s advanced technology group in Milwaukee, which has been experimenting for a year with two object products, a language called SmallTalk and an object-oriented database called Gemstone. "There's no goal to move whole hog into an object-oriented programming environment."

Mindful of the slow acceptance of any potentially critical technology, object vendors are going out of their way to underplay their products to avoid disappointing users. "The word *object* has been hyped a lot in the past couple of years," says Michael Connell, general manager at Servio Logic Corp. in Beaverton, Ore., the developer of Gemstone. "It's almost like the frenzy surrounding AI [artificial intelligence] a few years back. Anything with an icon is said to be object-oriented."

Innovative Systems Techniques Inc. (INSYTE) of Newton, Mass., has sold a financial analysis system called Vision to about seven investment banks and brokerage houses in the past two years. Key to the system is an object database and proprietary object-oriented programming language that lets users pull financial information from a variety of commercial databases to perform specialized yield analysis.

"When we first started selling Vision, we never mentioned object technology," says Richard Newman, INSYTE's marketing director. "When *object-oriented* got to be a buzzword, we started to talk about it a little bit, but I'm not sure talking about it has been a help or a hindrance. Our market tends to be conservative. The idea that we're selling something futuristic could scare our customers away—especially if we were to be lumped in with the AI set."

Big Payoffs in the 1990s?

The conservatism stems from the realization that up to five years may pass before object technology starts to deliver its promised benefits in a big way. Factored into the incubation period, reminiscent of the one that the relational database market experienced before bursting on the IS scene, are management and professional issues, as well as the expected technical hurdles. The considerable difference between structured and object programming means that the latter will face a steep learning curve.

"A move to object-oriented programming can mean a major sell to the entire company," says Norman Kerth, a consultant in Portland, Ore. "In many cases the people who best understand the need for object-programming are technical workers who may not be in a position to persuade upper management." Those technical workers also may resist using somebody else's software blocks (objects) to build an application, particularly if such materials lack proper documentation. Once a user organization does build a library of objects, the question arises: Who controls the library—central IS or individual product groups?

The proper use of object technology requires a substantial customer investment in training. Unless programmers are willing to go through a three- to six-month education process designed to change the way they think about systems design, they probably won't be able to do true object programming.

Heightened Vendor Activity

The object paradigm is, to be sure, a radical departure from past and present programming frameworks. Born in the early 1970s at Xerox Corp.'s Palo Alto Research Center (PARC), the idea was to develop a language (SmallTalk) that bypassed the abstract thinking of conventional programming. Doing so, Xerox researchers thought, would allow children to create programs by stringing together blocks of prewritten software. Like many things to come out of PARC, the idea was ahead of its time.

Hoping to be for once the one to cash in on PARC's innovation, Xerox last year created a subsidiary, ParcPlace Systems, to market SmallTalk. Xerox has also licensed SmallTalk to an assortment of vendors: Apple, Hewlett-Packard Co., Sun Microsystems Inc. and Tektronix Inc. These companies' interest signals the enormous commercial potential for object-oriented products, which is attracting both start-ups and billion-dollar vendors to the field.

AT&T's object programming language C++ is gradually moving from research labs into the hands of object software vendors and advanced technology groups within corporations. HP recently introduced New Wave, an object-oriented programming environment that will enable programmers to link software objects together. Microsoft is working on an object programming environment. Elements of object-oriented technology are showing up in new computer hardware, most notably IBM's AS/400 and the NeXT Inc. workstation. In addition to object-programming languages, a proliferation of companies are developing and selling early versions of object-oriented databases (see sidebar, "A Partner, not a Predator").

Some Inherent Advantages

Vendor activity notwithstanding, object technology remains difficult for most programmers to grasp because it rejects the idea that code and data should be separate. Instead, it binds them together in modules or objects. Each object, in fact, encapsulates both data and a set of instructions that describes behavior and attributes of the object. Objects may vary in size from a small routine to an entire application. Messages passed among objects determine how one object interacts with another.

Encapsulation offers a few advantages

A Partner, not a Predator

So you've just wrapped up a costly multiyear, multimillion-dollar project to convert your old IMS database to DB2 and you're feeling pretty smug. Well, brace yourself for the next step in database evolution: object-oriented databases.

Relational databases mark a dramatic improvement over simple file systems with no inherent structure. Using query languages, users can sort through volumes of data arranged in a logical hierarchy. But the logical relationships of the relational model don't always match real-world relationships, particularly applications that have a large number of complex data types, such as computer modeling or computer-aided design and manufacturing.

Enter object databases, in which the data structure is determined by the relationships among objects.

Computer-aided design and manufacturing, with its baffling complexity of screws, bolts, parts and subassemblies, appears to be an ideal target for object-oriented databases. Dataquest Inc. estimates 10% of CAD/CAM vendors today employ some form of object-oriented database. By 1995, most CAD/CAM applications will be written on top of object databases.

One high-tech firm that is starting to kick the tires on the new technology is Boeing Aerospace Corp. in Seattle. Like many large manufacturers, Boeing faces the problem of having to navigate its way through a plethora of hardware and software platforms: IMS databases, graphics databases, COBOL and FORTRAN applications. The company is investigating a project to link its Oracle relational database system with Gbase, an object database from Waltham, Mass.-based Graphael Inc.

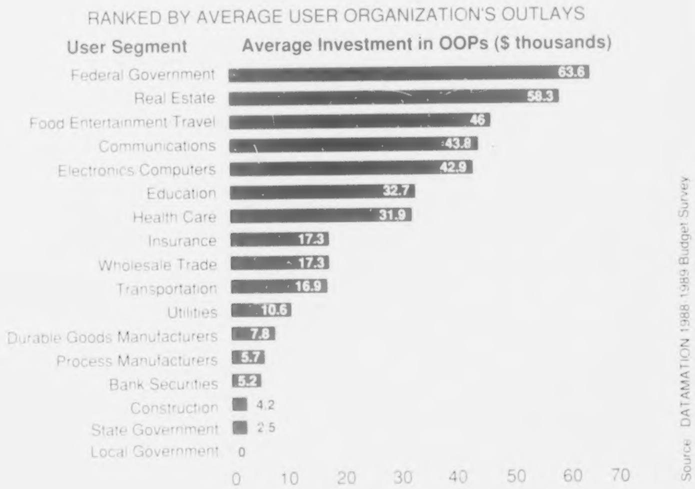
"The advantage of an object database is that it can look at nonstandard data sets, such as graphics and large binary files," explains Patricia Davis, software engineer at Boeing. "Object database[s] can also look at other databases and treat them as objects."

This kind of cross-systems role is one area where object databases could prove useful for IS shops now attempting to distribute databases across the corporation. "Once you distribute the data, it's naive to assume one database technology can serve all end users," says object analyst Jeff McKenna.

Boeing's use of Gbase and Oracle together may also be indicative of the niche role object databases will play: object databases won't supplant relational technology, they will augment it. "In most customer sites, we tend to be a little piece of the solution, but an essential piece, in that it's Gbase that gets you in and out of other databases," says Joe Hancock, president of Graphael.

Who's Developing Object-Oriented Applications?

U.S. agencies and commercial real estate firms are most aggressively pursuing OOPs solutions in 1989.



Source: DATAMATION 1988 1989 Budget Survey

over traditional programming:

- Complex relationships between data elements difficult to capture in the abstract can often be more accurately modeled by the structure of objects and the messages that determine how the objects interact with one another.

"Objects let users model their own world," says Esther Dyson, editor of "Release 1.0," an industry newsletter.

- Interdependence among objects is strictly limited by the messages that they can send and receive. A change within one object will not affect the behavior of another object. That means maintenance of an object system will not be nearly the headache it can be with existing large systems.
- Larger systems using interrelated but independent objects can be built.

The Airline Marketing Tactician, a program designed to let airlines balance no-shows and overbooked seats on a flight-by-flight basis, is a good example of an application that fits well into the object framework, but which would have been difficult, if not impossible, to write in linear code. Written in SmallTalk, the program estimates demand for the half a dozen or more fare classes that carriers typically offer, from full-fare to deep-discount.

"It might have been possible to write this application using conventional programming, but it would have taken a multimillion-dollar budget and 20 people," says Ken Stevens, chairman of BehavHeuristic, developer of the Airline Marketing Tactician. Using SmallTalk enabled the College Park, Md., company to develop a prototype in three years with just two people.

Another key feature of the object approach is a quality known as "inheritance," which allows the attributes and behaviors of one object to be incorporated into another object. Objects can be structured in class hierarchies: plant, angiosperm, tree, chestnut and so on. To add a new subclass (American chestnut), the programmer need not start from scratch, rather he needs only to specify the attributes that differentiate the new object from the other objects in the class hierarchy.

The benefits of inheritance can be seen in a graphics application, where the instructions to display or manipulate a shape can be inherited by other subclass objects. Bart Shutte, manager of object-based development with Andersen Consulting in Chicago, found inheritance to be a boon when he used SmallTalk to help a client build four graphics application packages. "It took two of us four months to build the first one," Shutte says. "The other three we built in one month each."

Software Libraries of the Future

Just as inheritance speeds the development of applications, there are even greater advantages that may result from object software's reusability. Vast libraries of object routines and procedures, even object applications, could one day become available. Once that happens, off-the-shelf commodity objects could be assembled to form applications the way off-the-shelf integrated circuits have speeded up and reduced the cost of computer hardware.

The development of reusable object libraries is moving slowly, but it's starting to happen. Applied Intelligent Systems Inc. (AISI) is an Ann Arbor, Mich., company that builds machine vision systems used for assembly and inspection in the automotive and electronics industries. The company is using Stepstone's Objective C product to convert into objects its library of about 450 functions (some of which need to be packaged into higher level software with each system it sells). The conversion, once completed, will enable AISI to build semicustom systems much more efficiently.

The project is moving along well but slowly. It's also not yielding astronomical productivity increases. One of the problems is the steep learning curve for using an object-oriented language. Since C programmers must learn to forget old ways of doing things, it takes about the same time to retrain an existing programmer as it does to break in a new programmer—three to six months. "We're seeing more like a two- to threefold improvement," says Dave Coupland, AISI's manager of software engineering.

Improvement in the price/performance of computer systems has removed one minor technical obstacle to object-oriented programming—the fact that it consumes about 10% more computing power. Today's workstations, in fact, can easily run most object applications. Moreover, hybrid languages like Objective C and C++ offer better performance by grafting object capabilities onto conventional languages. "There's adequate computer power available," says Jeff McKenna, a consultant in Taulitin, Ore.

The bigger issue, say McKenna and others, is how much power IS executives and their superiors can exert in influencing their staffs to objectively assess object technology. The management team's awareness of how programmer efficiency affects organizational profitability can only help the cause of object technology.

David Stamps is a freelance writer in Minneapolis, Minn.

MANUFACTURING

SECTORS

SCAN

AI Keeps Rohm and Haas Trucking

ROHM AND HAAS IS FINDING THAT EVEN SIMPLE TASKS BENEFIT FROM EXPERT ADVICE. THE CHEMICAL GIANT IS USING ARTIFICIAL INTELLIGENCE TO DETERMINE THE BEST WAY TO LOAD ITS TRUCKS WITH ITS SOMETIMES VOLATILE CARGO.

When it comes to figuring out the best way to load a 48-foot tractor-trailer with drums and pallets containing its product, Rohm and Haas Co. has a great idea: use AI. The $2.5 billion Philadelphia-based chemical concern has just produced an expert system that determines the ideal way to load and brace its sometimes hazardous cargo so that the truck doesn't blow sky-high when the driver stops short.

Rohm and Haas is trucking more through AI.

The expert system was completed in March 1988 and is now being tested by end users—shipping supervisors at several Rohm and Haas plants. From input such as the type and size of the truck, the content and number of drums, the number of pallets and the sequence in which the material is to be unloaded, the expert system generates a series of printed diagrams showing loading personnel where to place and how to stack the material on the trucks and where to insert bracing boards to prevent the load from shifting in transit.

According to Marina Dussan, a knowledge engineer with Rohm and Haas' Expert Systems Group, the system calculates the most efficient way to load the product on the truck, determining whether the load will fit and not exceed weight limits. The system knows which compounds react with one another to prevent loaders from stacking deadly combinations. "It basically does the whole job," says Dussan.

The application uses Texas Instruments Inc.'s Personal Consultant Plus expert system shell and was developed using mostly internal AI personnel. Rohm and Haas has deployed six systems in three plants, running on a combination of 286-based machines from IBM and Televideo Systems Inc. So far, says Dussan, the systems are performing well. However, "they're a little bit slow, and we're trying to find out how to speed them up a bit." Over the next two years, Dussan expects these bugs to be ironed out. By then, the system should be operating at each of Rohm and Haas' remaining four plants. ◀

INSIDE

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Editor: Linda Runyan
Scan Writer: Michael R. Leibowitz

Sara Lee's New Recipe for Success

Sara Lee Corp. knows it takes more than scrumptious products and a well-loved name to ensure success in the rough-and-tumble baked goods business. It takes flexibility, as well, so the $8 billion Chicago-based food and consumer products company is now building a plant that will react quickly to changes in demand for its over 1,000 bakery items.

The Tarboro, N.C., plant, which is less than six months from starting operation, will be able to produce four times the number of different products in one day than can be made in the company's other plants. The new plant's production schedule can be revamped each day, shifting production to whatever the market seems to be buying at the time.

Rather than being process-driven, the Tarboro plant will depend on an information-based system, says Gerry Doherty, vice president of engineering in Sara Lee's bakery division. The plant consists of a number of "cells" that perform specialized functions, such as mixing batter, depositing the batter in pans, baking, frosting and packaging. Depending on how a product is routed through the various cells, it can become a chocolate cake or a croissant, a bran muffin or a bagel.

Production is controlled by a Digital 6210 minicomputer linked via Ethernet to a raft of cell controllers consisting of a 386-based PC located at each cell. At the start of a day, the minicomputer sends part of its daily schedule to the cell controllers, telling them such things as baking times, oven temperatures and the route of a product through the labyrinth of cells. Holding the instructions necessary for four hours of production, the cell controllers run the manufacturing process, loading products in, and routing them from storage buffers between the cells.

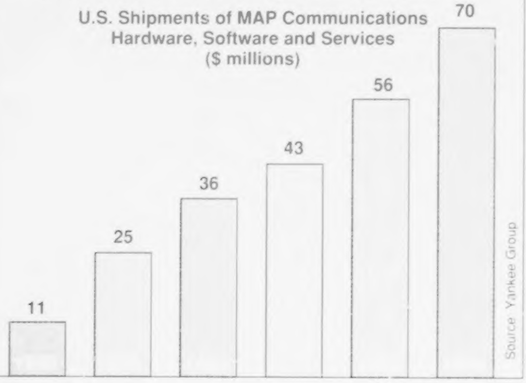
Sara Lee
NEW!
ALL BUTTER
CINNAMON
Rolls
Ideal for Microwave

Baked by a DEC mini

The Tarboro plant, developed with the help of outside systems integrators, will use bar codes for inventory control and for tracking materials and personnel through the manufacturing process. ◀

MAP MOVES INTO THE MARKETPLACE

With the advent of version 3.0, Manufacturing Automation Protocol is poised for moderate growth in the U.S. market.



Source: Yankee Group

PCs in Lab Keep Nike out In Front

The heart of a running shoe is its midsole, and, thanks to two IBM PC ATs in its Sports Research Lab, Nike Inc. is starting to collect information that will allow its designers to produce midsoles to protect the foot from injury while allowing wearers to run faster and jump higher.

The Beaverton, Ore.-based shoe manufacturer uses the PC ATs to model the pressure distribution across various types of midsoles, ranging from ethylene vinyl acetate foams to the company's patented air-cushioning system. The modeling, says Martin Shorten, director of the lab, gives designers a close look at how these materials respond when people walk or run at different speeds.

Nike's PC AT gets at the sole of a new running shoe.

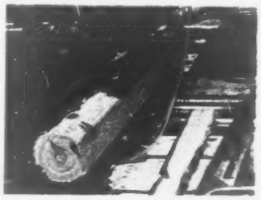
Nike's midsole modeling system works like this: a runner jogs down a 150-foot runway in the lab, stepping on a 9 × 12-inch plate containing a matrix of 2,000 pressure sensors. A PC AT scans the plate 100 times a second and stores the pressure information on a hard disk. Following the test, the data are fed to another PC AT, along with the dimensions of the midsole and its viscoelastic characteristics. The second machine generates a series of plots showing such things as how much and how rapidly the midsole depresses during impact, how much strain energy is absorbed and how much heat is dissipated.

The result is a series of animations showing the two-dimensional surface of the midsole, along with a profile of just about every characteristic a designer could care about, according to Shorten. The system has been operating for a little over a year, Shorten adds, and is finally starting to change the way Nike develops midsoles. ◀

Potlatch Logs On to Automation

How do you saw up a giant log into individual pieces of lumber? There may be an infinite number of ways, but computers at Potlatch Corp.'s newly renovated saw mill in Lewiston, Idaho, select the exact one that yields maximum value from each fallen tree. The mill, which has been operating since January 1988, uses four of Digital's Micro PDP 11/73 computers to control a series of saws that slice and dice huge 55-foot logs cut down from forests in the great Northwest.

Each log is scanned by a matrix of light beams that provides profiles to the computer, which combines this information with the species of the log in question and the current wholesale price of lumber to figure out how many 2 × 4s, 1 × 6s, 1 × 8s and other lengths to cut from the log. Based on the results of the 11/73's optimization program, the saw is instructed where to place the cuts.



AI helps Potlatch carve out greater profits.

After passing under four saws, each controlled by its own 11/73 and having its own scanners, the log is completely cut up into pieces. Before each cut, the log is rescanned, and a new optimization is performed on the dimensions of the remaining piece.

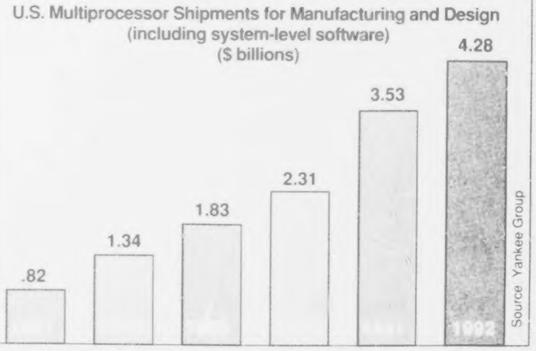
The four 11/73s are connected via RS-232 links to an IBM PC AT, which gathers data on the number and type of products hewed from the log, the percentage of wood recovered and the value of the finished product. Each 11/73 is updated monthly with new optimization data if lumber prices change.

The Lewiston mill is not the first of its kind in the lumber industry, but it is a first for the conservative, $1.1 billion lumber, pulp and paper company. Prior to this, mill operators would eyeball the log and use lasers to trace outlines of the proposed cuts. With the new automation, provided by Canadian systems integrator Kockums Cancar Inc. of Surrey, British Columbia, some of the saws run five times faster than they did previously, says Mike Fish, modernization project engineer.

Wrinkles have yet to be ironed out of the system, says Fish, but this is expected to occur by midyear. Still, declares Fish, "anybody who's in the lumber business today has to have this kind of equipment to get the recovery and speeds needed to be competitive." ◀

NEW COMPUTER ARCHITECTURES

Manufacturers are adopting multiprocessor computers for more and more tasks in the factory and design lab.



Source: Yankee Group

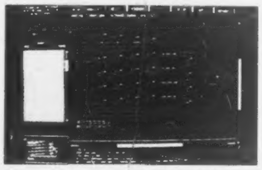
Unisys Shrinks Chip Development Time

Designing chips quickly is one key to success for makers of electronic equipment, and a new software tool developed by Blue Bell, Pa.-based Unisys Corp. allows its chip designers to slash the amount of time it once took to turn out a design. Using proprietary software, Unisys designers can now design chips at the so-called behavioral level, a more abstract and less detailed design level than the logic level, which is where most chip design is done today.

Instead of developing time-consuming logic diagrams and entering those into the CAD system, Unisys designers generate chips by writing lines of code that describe the exact behavior of the intended circuitry. The software, which Unisys calls its Modular Development System (MDS), then takes over, turning out the circuitry schematic—and, with other CAD tools, the actual layout—for the eventual chip.

With MDS, says Herman Brown, senior physicist at Unisys, "We are not tied down to drawing all the nitty gritty logic that we have to do at the schematic level." The resulting time savings are impressive: Brown reports a 60 to 70% reduction in chip development time using MDS versus schematic-level design.

Approximately 70 Unisys chip designers currently use LISP-written MDS to turn out chips containing hundreds of thousands of transistors for a range of machines. The tool, for example, was instrumental in allowing Unisys to condense 533 circuit boards into a single board for its Micro A desktop computer. The MDS tool runs on Apollo Computer Inc. workstations and 386-based PCs and works in concert with other chip CAD tools, both purchased and internally developed. ◀



New software helps Unisys speed chip development.

Ford Crashes Cars on a Convex

Designing new bumpers used to be a painfully slow process, taking two to three months to build each prototype, attach it to a car and crash test it. But now, designers at Ford Motor Co. are banging out bumper designs with the help of a minisupercomputer from Convex Computer Corp. of Richard, Texas.

A Convex minisuper lets Ford put its bumpers through their paces before you do.

A new system using finite element analysis allows the Dearborn, Mich.-based car maker to perform multiple impact five-mile-per-hour crash tests against barriers and other cars with the press of a return key. The system also enables the engineering department to test various ideas for bumper designs.

The system taps the power of the Convex C210 minisupercomputer, running around the clock, to turn out a new design and a series of crash tests in less than a week. Designs are first modeled on either a Digital MicroVAX II hooked to a Tektronix color graphics terminal or on Ford's Prime-based CAD system. Then, an engineer selects such options as type of crash, speed and weight of the car and starts the simulation.

The computational analysis of a 100 millisecond crash runs for 16 to 24 hours on the dedicated Convex, according to Gregory Kaepp, a technical specialist at Ford.

The result of the overnight simulation is a color image of a crashed bumper, showing high-stress areas in red. Kaepp can collect a sequence of images and create an animation of the crash, or, following the first simulation, he can "crash" the car repeatedly to see how the bumper stands up.

Rotating the bumper on the screen in its deformed state, designers can find out where to add bumper material to strengthen the design and where to remove material to lower cost and weight. Following a volley of simulations, a model is developed and crash tested on a real car, to verify results. ◀

Ordering up Performance at GAF

Two years ago, Wayne, N.J.-based GAF Corp. was not exactly known for its ability to ship product to customers on schedule. "A customer," says MIS manager Dick Refsler, "would place 20 orders with you, and maybe two or three would ever get shipped." Luckily, that's changing now with the new GAFMASTER order entry and scheduling system that the $1 billion building products company is installing.

GAFMASTER, which GAF spent the last 18 months developing and testing, runs on a series of IBM 5364s located in each of its U.S. manufacturing sites. The 5364s handle order entry, production scheduling and shipping paperwork for each factory individually, driving 13 workstations per site.

But the real distinction of GAF's new system is the fact that it improves the plants' ability to plan production. Orders are allocated based on a production plan, and customers can be told, with reasonable reliability, when their orders will be shipped.

In fact, the system has already been providing 85 to 95% accuracy on shipment dates, a marked improvement. "It's been working out very well," says Refsler. "The decision was made that we had to service our customers. We're saying: 'We'll be able to give you that product, and here's the date.' "

All this is a far cry from the old order-entry system, says Refsler, which was a batch operation that did not provide the access to ordering and production data that the new system does.

In fact, GAFMASTER provides the foundation for a computer-integrated manufacturing effort that GAF will execute over the next five years, involving automation of the production lines.

As of April, GAFMASTER was running at seven of GAF's 11 sites and, by June, GAF expects it to be running at two or three more. At the end of the day, each system calls up the corporate IBM mainframe, updating accounts receivable and other records.

Many of GAF's competitors are centralized. In contrast, GAF's decentralization in computing is in accord with its decentralized manufacturing strategy. "We feel we can do much better by letting the local site handle itself," Refsler concludes. ◀

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INTERNATION

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What's D[illegible] In Larg[illegible]

A Weaker Dem[illegible] Big Iron MIPS Is C[illegible]

3090 Upgrades

Th[illegible]

Not Just [illegible]ware?

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JUNE 1, 1989
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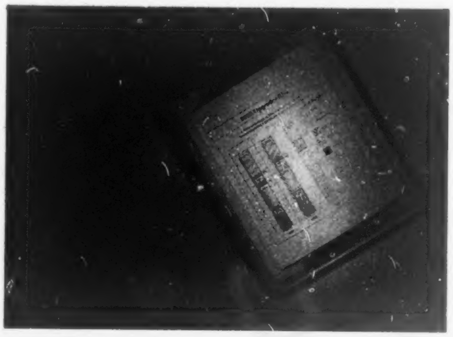
FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE



What's Developing In Large Systems? 18

BY SUSAN KERR The 1989–1990 DATAMATION/Cowen & Co. survey of user spending and attitudes reveals relatively flat demand for large systems and hesitancy about new technologies such as IBM's ESA and SAA. At the same time, the fact that IBM's mainframe flagship, the 3090 series, is reaching the end of its life cycle and a successor product is not yet in view may be good news for plug-compatible computer maker Amdahl. Unisys' large-system sites, meanwhile, are signaling pent up demand, even as dissatisfaction continues among former Sperry users and new signs of discontent arise from the former Burroughs camp.

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BY J.M. CAREY AND J.D. CURREY Prototyping, firmly rooted in a majority of development shops, is often portrayed as a quick way to reduce software backlogs. But the activity is more often practiced to increase user satisfaction through improved requirements analysis.

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BY JEFF MOAD IBM is crafting a series of industry-specific extensions to its Systems Application Architecture (SAA). New interfaces, tools and data models are involved. But how far will these extensions take SAA?

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BY BOB FRANCIS IS managers seem more willing than ever to embrace Apple's Macintosh computer, if you believe some recent market share figures and the raves from some state-of-the-art user sites, but there is a growing technology wish list accompanying the new romance.

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BY WILLIE SCHATZ Problems with designing and implementing a 386-based computer system to perform meat inspections for the Department of Agriculture has riled consumer groups, the meat industry and even government inspectors. Will consumer protection get roasted as a result?

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BY ALBERT L. LEDERER AND VIJAY SETHI A survey of 80 companies with experience in planning and implementing strategic information systems provides some tips for solving many of the most common planning problems.

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INSIDE DATAMATION

Charting the Course of the Industry

Since the fall of 1976, DATAMATION and the prestigious Boston investment house Cowen & Co. have joined forces to appraise the buying intentions of computer users throughout the United States and Canada. Twice a year—in both the fall survey of mini- and microcomputer users and the spring survey of large-system sites—the partnership works to develop as clear a view as possible of where the dollars are going. Users vote with their dollars: their planned purchases point decisively to what technologies are desirable and when; what markets will be viable and for how long; and, in an overall sense, to the economics of our industry.

Photograph by Liane Enkelis

SAN JOSE BUREAU MANAGER KERR: Finding the pulse of the industry.

This is not to say that the data are not open to interpretation. We would worry if things were so simple. But over the course of the DATAMATION/Cowen & Co. union, a body of data and a confidence in those data have emerged. In many ways, the record of this 13-year data stream, if you will, adds up to one of the industry's only true navigational maps, charting the course of our industry's past, present and future.

In this issue's survey of large-systems users, written by San Jose Bureau manager Susan Kerr, a decidedly complex outlook emerges. The data reveal the first hazy images of a slowing demand for big iron MIPs and uncertain emotions concerning new technology.

"At the same time," Kerr writes in our cover story, "What's Developing in Large Systems?" (p. 18), "Big Blue is faced with an aging mainframe product line and no successor on the immediate horizon. This could be to the benefit of plug-compatible manufacturers, especially Amdahl Corp., which may see double-digit growth in processor shipments this year."

Add to these currents the data showing fairly positive overall budget growth and what this year's survey comes down to is this: some positive surface signs coupled with an underlying message that IBM and its competitors will have their work cut out for them as they try to stay the course in the year ahead.

And Stopping at Points Along the Way

Kerr takes a look at the management of divisional and departmental local area networks in another article in this issue, "Playing in Concert." What Kerr has discovered is that corporate IS would like to orchestrate the selection and management of LANs. But LAN users may have been hearing a different tune. Turn to our story on page 55 to hear the score.

To further excite your senses, our story on the U.S. Department of Agriculture's meat and poultry inspection system shows how the wrong system can be indigestible. Washington Bureau manager Willie Schatz reports in "Where's the Beef?" (p. 49) that the system has raised the ire of consumers, inspectors and industry.

And to complete our menu for this issue, senior writer Jeff Moad reports, in another installment of our continuing coverage of SAA, that IBM is crafting a series of industry-specific extensions to the architecture. What do the extensions mean for the systems originally left outside the SAA umbrella? What do they mean for various industries? To find out, turn to "Son of SAA" on page 39.

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What's Developing In Large Systems?

The 1989–1990 DATAMATION/Cowen & Co. user spending survey reveals relatively flat demand for large systems and hesitancy about new technologies like ESA and SAA.

BY SUSAN KERR

Getting a clear, accurate picture of user buying trends in the large-systems market is a bit like trying to predict luxury car sales, but what is beginning to come into view is more slowly growing demand for big iron MIPS and mixed emotions concerning new technology.

Sharpening those images, it becomes clear that the desire for IBM's MVS/ESA operating system and Systems Application Architecture (SAA) is less potent than originally thought. At the same time, Big Blue is faced with an aging mainframe product line and no successor on the immediate horizon. This could be to the benefit of plug-compatible manufacturers, especially Amdahl Corp., which may see double-digit growth in processor shipments this year.

At Unisys Corp. sites, however, pent-up demand is evident from 1100/6-9X and A9/10 users, despite the continuing dissatisfaction among former Sperry Corp. users and new signs of discontent among A-series customers. MIPS-hungry Cray Research Inc. supercomputer users seem willing to wait and take their chances with future systems rather than jump on today's product bandwagon.

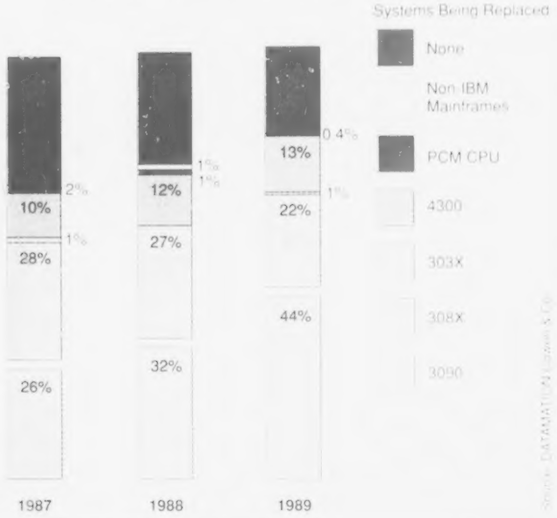
A market replete with many mixed signals and one increasingly dependent on product cycles and system upgrades rather than on outright systems replacement are just some of the conclusions drawn from the DATAMATION/Cowen & Co. Large and Midrange Systems User Survey. In its 12th year, the survey is a poll of more than 2,800 U.S. and Canadian customers of Cray, IBM, NCR Corp. and Unisys, seeking users' projected purchase plans and attitudes toward their vendors.

A look at specifics in the survey reveals that:

- Expenditures for systems-related goods and services may be on the rise, but the decision to spend is being tied more closely to specific vendor products and cycles.

3090 Upgrades Rise

A rising percentage of 3090 planned installations involve upgrading a previously installed 3090 system



Source: DATAMATION/Cowen & Co.

inority Interested in SAA

sites have the greatest interest in SAA.

Broad-based migration to SAA is foreseen only among users of the newest IBM systems.

- In terms of overall spending, the 1989 survey shows a rising, although still minority percentage, of respondents planning increases in their budgets. Of those projecting budget growth, the average planned per-site increase has more than doubled to 9.5% in 1989 from 4.5% in 1988. Spending increases may be a response to higher prices recently enacted by IBM, or they could be a signal of broader economic trends, such as inflation.
- Despite last year's introduction of the Y-MP system, one-third of respondents at Cray sites are waiting for future systems. Demand for capacity at the low end of Cray's line is also less than spectacular.
- The AS/400 is emerging as the bulwark of IBM's midrange systems business, although survey results raise questions as to its sales durability. IBM only began shipping it last August, but already the AS/400 accounts for nearly one-fifth of the respondent aggregate S/3X installed base in dollar terms. However, users report the possibility of a drop in new installations in the fourth quarter of 1989.
- Demand for additional disk drive capacity remains strong across the board, with IBM sites showing the greatest interest in expanding storage. Fully 56% of IBM users indicate the need for more capacity, versus 50% at NCR and 43% at Unisys sites.
- Only nominal 1989 unit shipment growth is projected for personal computers. Respondents' projections of OS/2 as their operating system of the future is still low.

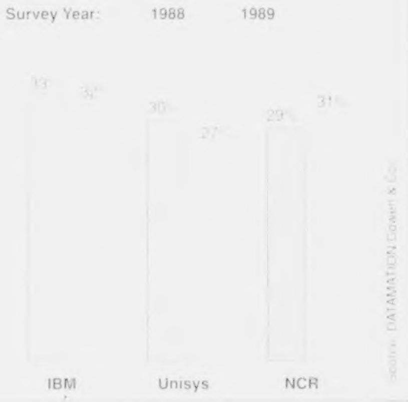
For IBM users overall, prices for a number of IBM products and services were raised last July by 3 to 4%, which users most likely took into account when answering the survey. That's the good news for Big Blue. However, this March, after survey responses were in, IBM announced an additional 5% worldwide across-the-board price increase. That's bad news if customers are not prepared to expand their budgets to match the hikes.

And they may not be, because customers apparently feel they are already getting more bang for their buck from their existing systems, according to the survey. Users at IBM 3080 and 3090 sites, on average, expect the company's price per MIPS to decline 13.1% over the next three to five years. When asked to project spending over the same time frame, this class of customers says hardware budgets will increase at an average 7.4% annual rate. This is one-tenth of a percentage point below what last year's respondents indicated.

The drop may sound insignificant, but these numbers signal the reversal of a long-standing pattern. Projected hardware growth at high-end IBM sites now is lower than the overall survey average of 8% annual growth in hardware spending over the next five years. But the strong AS/400 numbers may be the culprit in tilting the lead away from IBM's mainframe base.

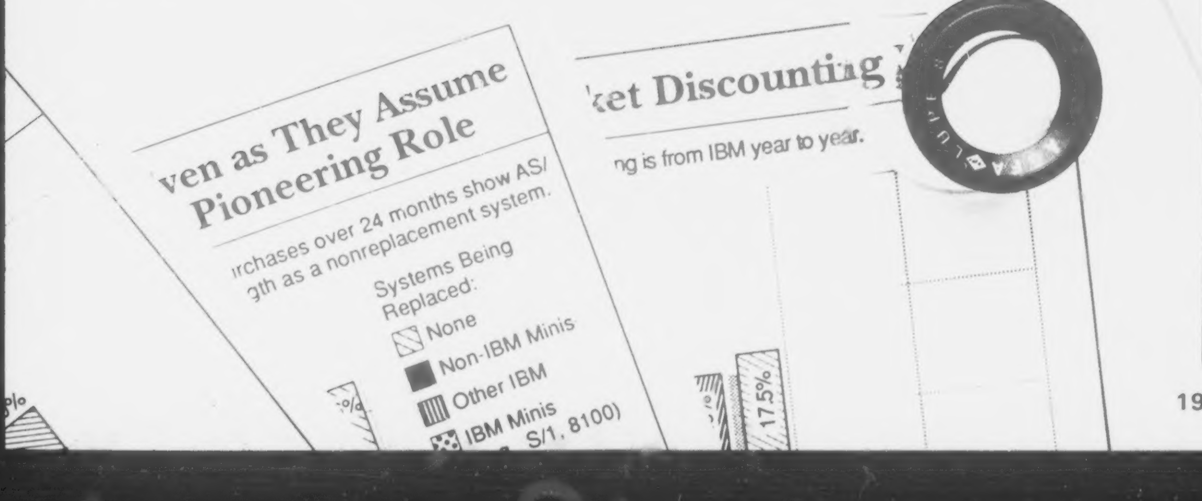
Dwindling Capacity Needs

Entering 1989, a somewhat smaller percentage of the user base is in need of additional mainframe capacity.



Source: DATAMATION/Cowen & Co.

Is it possible that the lure of MIPS for big-systems users is fading ever so slightly? While the mainframe might not be dying, respondents at mainframe



sites report being comfortable with their current capacity. Only 32% of the organizations indicate that they will need more mainframe capacity to meet 1989–1990 requirements, down from 33% last year. A steady 35% of organizations report needing more departmental systems (the same percentage reported in last year's survey), but more than two out of three PC users continue to want more capacity. The percentage of those reporting increased disk storage needs actually fell five points to 56%.

Translated into demand for MIPS, plans for 1989 show a dramatically slowing rate of increase. Total CPU power at 9370, 4300 and 30XX sites has grown 18% over the last five years. However, the average of 19.5MIPS per site at all of these installations is only 6% more than was on hand last year. That number pales in comparison with the 26% MIPS hike that occurred between 1987 and 1988.

Responses concerning future MIPS needs may be more to the liking of vendors, despite signs of a slight tapering off. In last year's survey, mainframe users pegged their per-annum MIPS increase for the next three to five years at 18 to 27%. The range in the latest survey falls only a bit to 15 to 25%.

One reason for these high but diminishing expectations may be next-generation products. In a sharp shift, the vast majority (73%) of large-scale IBM systems users believe that the 3090 successor product, code-named Summit, will not appear until 1991 or later. Compare this with the 69% of users who last year believed that Summit would hit the world by 1990, if not sooner.

So, users are apparently making do with what they have. IBM has not been shy with product introductions to its current 3090 family, such as the Model S, unveiled last July. But despite contributing mightily to the profit stream, the 3090 is showing signs of age. If, as users believe, Summit is two years away, the Model S may not be the last 3090 we see. IBM may be forced next year to announce another end-of-the-life-cycle 3090 product.

In general, a good chunk of mainframe users seem cautious about trying new things. Some of this apathy may be related to a natural reluctance to move into the unknown. Or it may be that IBM is not making the case for new offerings or directions. Certainly, neither MVS/ESA nor SAA is living up to its heralded beginnings.

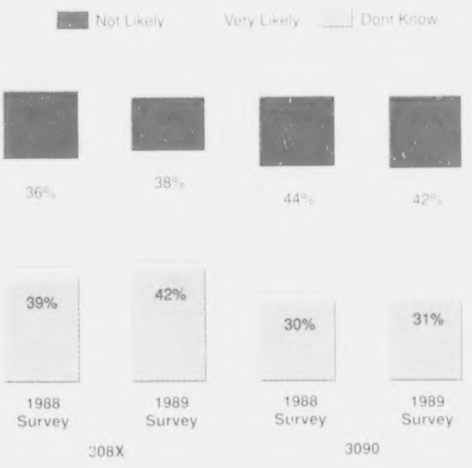
MVS/ESA's acceptance rate may step up following some recent price cuts in storage and memory, which could bring down the cost of using the new operating system. Those price cuts were announced after the survey was completed. In the survey, more than 42% of MVS/XA users were already planning a conversion to MVS/ESA by year's end. As promising as this sounds, the number is only two-thirds of what was indicated in 1988.

Users of plug-compatible manufacturer (PCM) systems feel even less urgency to adopt MVS/ESA. Only 25% of users at PCM sites think the end of the year is the latest time acceptable for their suppliers to make

> Responses concerning future MIPS needs may be more to the liking of vendors.

Interest in ESA Holding...

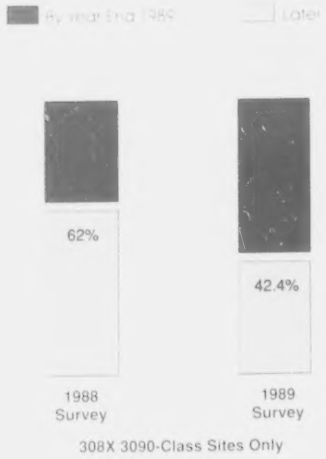
Larger percentage of 3090 users are interested in ESA, but a rising number of 308X/3090 users are hesitating



Source: DATAMATION/Cowen & Co.

...But Cutover Moving More Slowly

Almost 19% more users say they will install ESA later than they said they would in 1988



Source: DATAMATION/Cowen & Co.

Even those IBM users moving to SAA aren't very clear about what gains they'll be getting.

their products fully compatible with MVS/ESA. That falls into the time frame that PCM vendors have set for themselves.

What's To Be Gained From SAA?

And then there's SAA. Only one-third of all respondents at IBM sites are showing any interest in migrating to SAA. Broad-based migration to SAA is foreseen only among users of the newest IBM systems. Furthermore, half of the respondents at 3090E/S sites plan to migrate to SAA—as well as 63% of respondents at AS/400 sites, the first product to conform to SAA.

One reason for the disinterest is that even those IBM users moving to SAA aren't very clear about what gains they'll be getting. Asked how much SAA will help with their new-applications backlog, the respondents indicate little anticipation that SAA will dig them out.

Neither will packaged software. There is no evidence in the survey that users are shifting from in-house programming to packaged software, despite applications backlogs amounting to years. But don't cry for the software vendors: users are projecting a slightly slower, but still nice, 8.2% rate of increase for packaged software spending during the next three to five years.

The bad news for IBM is that this is the seventh year in a row that it's getting a smaller percentage of the money earmarked for packaged software. In 1989, the average IBM customer is spending 54% of his or her packaged software budget at IBM, down three points from last year.

This erosion comes at the same time that IBM is forced to deal with the 3090. As is expected with a five-year-old product, a rising percentage of 3090s are supplanting a previously installed sister product. Survey respondents report that 44% of this year's 3090s are upgrades for members of the same family, up from 32% last year. A shrinking though still significant number, 22%, of 3090s are replacing 3080s, and a small though rising number, 13%, are superseding 4300s. But one-fifth of this year's planned 3090s are not replacing anything, down from last year's 26% new installations.

This means that upgrades are king, a conclusion further borne out by the decline in the average 3090 price. It now stands at $2.7 million, which is $600,000 less than the amount users were willing to fork over in 1988.

Furthermore, the 3090 is doing a poor job of replacing non-IBM mainframes or plug-compatibles. Less than .5% of 3090s are kicking out other vendors' systems, compared with 2% in 1988. IBM has lost some of its high-end systems market share to Amdahl, which is now supplying 7.6% of the units in the 30XX mainframe class, up one percentage point from last year, the survey reveals. Market share for IBM and National Advanced Systems Inc. each fell less than a percentage point to 89.6% and 2.8%, respectively.

IBM may be on the defensive, if its more aggressive discounting steps are a clue. While its pricing incentives are still less generous than those offered by Amdahl and NAS, IBM granted users average discounts of almost 10% off list price, survey respondents report. But Amdahl and NAS discounts were roughly 17%.

Amdahl could be rewarded with double-digit growth in processor shipments this year. The PCM vendor's newer systems, the 5890 and 5990 models, seem to be well accepted by the market. While these two systems make up less than half of the company's current installed units, the survey reports, users expect them to account for a huge chunk of future activity. Of those Amdahl sites where future purchases are planned, half are expected to be 5890s and another 25% will be 5990s.

Budget Growth Starts To Climb

Undoubtedly, the good news in this year's DATAMATION/Cowen & Co. Large and Midrange Systems Survey is that data-processing budgets are expanding at the fastest rate since 1984. Budgets will rise an average 9.5%, more than double last year's increase. Nonetheless, the numbers appear to be selectively upbeat, particularly if economic factors are taken into account.

Spending for two areas is beginning to slacken: personal computers and teleprocessing equipment. Growing at a mere 5% annually, PC budgets, which grew the fastest of all categories in 1987 and the second fastest last year, this year slipped to dead last. Unit growth for PCs is even more dismal; those surveyed project only a 0.3% gain over last year. That's better than the 5% decline in PC unit shipments recorded this past summer in the DATAMATION/Cowen & Co. survey of minicomputer and microcomputer users. Teleprocessing equipment, although slowing, remains healthy with a still highly respectable 7.2% upward swing in projected spending.

The big gainers in this year's budgets, when compared with last year's outlays, are staff salaries (up 5.4%) and IBM CPUs/peripherals, up 5.2% (which almost matches exactly the price hikes IBM enacted last year). Spending for software packages has improved, too, with survey participants projecting spending increases of 6.9%.

Despite dollar gains, hardware and packaged software are losing some of their share of respondents' total budget outlays. Today they account for 40% of all DP budget money, down from 42% last year and 44% in 1987. Hardware still accounts for almost three times more budget money than packaged software. PCs are responsible for almost one-third of all hardware monies.

So, for what are people budgeting? The answer continues to be for other people. Obviously, neither technology nor even the much-hyped systems integration boom is lessening the dependence on in-house employees. Staff salaries are up, perhaps in anticipation of inflation, and for the second year in a row account for 41% of the average budget. Staffs also are not being displaced in favor of outside services. For 1989, those surveyed anticipate spending only 8% of their money for outside services, such as systems integration.

Even though its customer loyalty equals that of Amdahl's, NAS' future is somewhat cloudier, given its smaller installed base and the uncertainty it experienced before it was sold to current coowners Hitachi Ltd. and Electronic Data Systems Corp. earlier this year. But both PCMs have work to do. A full 12% of Amdahl and NAS users say that, when the time comes to replace their systems, they are planning to change vendors. While that number is high, in both cases it is slightly lower than it was last year.

Pent-Up Demand in the Unisys Base

One out of six Unysis users are also looking for a change. Seventeen percent of all Unisys users this year are seriously considering switching vendors, down from 19% last year. As in previous years, applications package selection is still a significant reason for discontent.

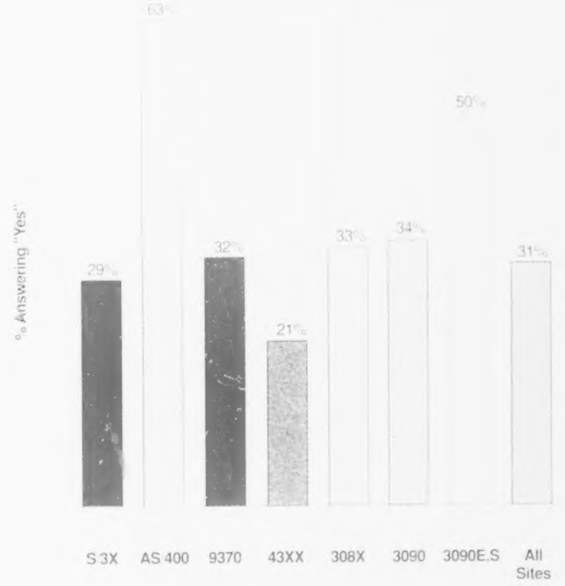
Former Sperry users are somewhat less dissatisfied with Unisys than they were in 1988, although 37% of 1100 series users say their opinion has turned more negative in the past year. The highest level of discontent appears in the midrange 1100/6X-7X base, which is waiting for delivery of follow-on 2200 products in the second half of this year.

The former Burroughs Corp. base remains positive for the most part about Unisys, though there are indications of restlessness among A-series users. Thirty-three percent of large A-series customers say they have a more positive opinion of Unisys than they had last year, which is well below the 43% who gave the thumbs up in 1988.

On the bright side, unquestionably demand is there for new Unisys products. For example, 39% of the A 9/10 class users need more capacity, which is good news for the company, since Unisys has products coming down the line. Fifty-four percent of 1100/6X-7X users and 40% of 1100/8X-9X users surveyed plan to upgrade to the new 2200 systems.

Still a Minority Interested in SAA

AS/400 and larger 3090 sites have the greatest interest in SAA



Source: DATAMATION/Cowen & Co.

Of those not planning upgrades, nearly half say their present systems are fine for now, indicating future demand for Unisys.

However, it takes more than new pieces of hardware to stimulate growth; it takes new applications. The survey demonstrates the maturity of the market

Some Downward Pressure on Peripherals

If IBM ever spun off its peripherals business, the new company would immediately earn a place in the *Fortune* 100. Peripherals are that big a business.

Peripherals are also going IBM's way, judging by this year's DATAMATION/Cowen & Co. survey of purchasing expectations of large-scale systems users. Except for the tape drive segment, IBM is gaining market share in the peripherals business.

Yet, there is obviously some downward pressure on the business. Responses to the survey indicate that users at 30XX and 9370/43XX sites are less likely to install disk drives, tape drives or terminals in 1989 than they were in 1988.

Nonetheless, there is still quite a bit of activity, considering that 51% of the 30XX users and 42% of the 9370/43XX users have plans for new disk drives. Expectations are that terminals will be added to one out of three such sites, and additional tape drives are expected for 31% of 30XX, and 2[illegible]% of 9370/43XX, sites.

As would be expected, users of IBM S/3X and AS/400 equipment run counter to the downward trend and are buying more peripherals than last year. Still, the planned activity is much lower than seen at large-systems sites. Only 10% of these midrange users plan to install new tape drives, 18% plan to add disk drives and 33% expect to purchase more terminals.

Despite some of the falling numbers, demand for additional disk drive capacity is highest at IBM sites. At least 56% of IBM users indicate the need for more capacity versus 43% at Unisys Corp. and 50% at NCR Corp. sites.

IBM seems to have recovered from its slip two years ago when it lost points in the 3380-class disk market. A look at planned disk drive acquisitions for 1988 – 1989 shows that IBM is gaining share primarily from National Advanced Systems Inc. Ninety percent of this year's respondents will turn to IBM, up from 87% in 1988 and 82% in 1987. Amdahl Corp. will hold steady at 3% and Storage Technology Corp. will drop from 3% to 2%. NAS is down from last year's 6% share to 1%.

Likewise, Big Blue is continuing its upward climb in sales of CRT terminals. Of those users planning to buy terminals between now and the end of 1990, 81% say they will choose IBM, compared with 75% in the 1988 survey. Memorex Telex Corp. and Idea Courier Inc. are both losing share.

for some applications but indicates growth opportunities for other products. Among IBM users, for example, word-processing software is growing at a mere 3% annual compound rate. Electronic mail, in contrast, is growing at a 20% rate and voice messaging is surging annually by 41%.

Who Craves Crays?

Meanwhile, the fast-paced evolution of technology is having an effect on Cray. This year's survey contains findings that could portend a protracted period of moderate shipment growth for the Minneapolis-based supercomputer supplier. Results indicate that Cray probably will have revenue growth in the 10% range this year, with 1990 showing only so-so gains.

The reasons are a combination of technology and budgets. Despite last year's unveiling of the Y-MP system, one-third of respondents at Cray X-MP/4 sites have altered installation plans to await future systems, namely the Cray-3 (due in 1990) and/or the C-90. Another one-third of these users are undecided.

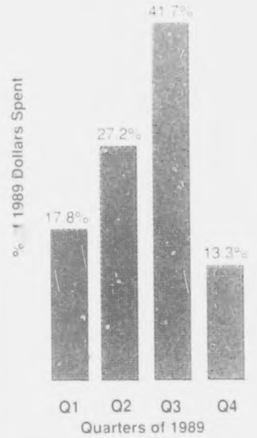
The next-generation blues are also apparent at the low end of Cray's current base. More than 60% of the users of one- or two-processor X-MP systems claim to have no plans to install the new Y-MP systems. The reason? Again, one-third of these users are waiting for the next generation. But another third said they don't have the funds.

Other replies also indicate less-than-spectacular demand for more capacity at the low end. Seventeen percent of those with two-processor systems and 25% of single-processor users say they need more capacity in the 1989–1990 time frame. That number jumps to 60% of the four-processor base. Overall, combined responses from all sites indicate that the average percentage of users needing more capacity has dropped from 52% last year to 35% in this latest survey.

Software is also a big bugaboo for these Cray customers. Data base software is ranked as inferior by

AS/400 Shipments May Peak in Q3...

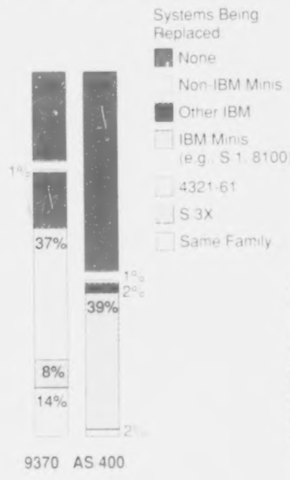
Drop in Q4 1989 raises a question as to buying patterns in 1990.



Source: DATAMATION/Cowen & Co.

...Even as They Assume A Pioneering Role

Planned purchases over 24 months show AS/400's strength as a nonreplacement system



Source: DATAMATION/Cowen & Co.

What's Happening With the AS/400?

IBM undoubtedly is getting a real kick from its AS/400 midrange family, which should make 1989 a respectable year overall for the company and even the industry. Big Blue needs it, considering the rather pathetic showing of the 9370, the falling volumes of 4300 systems and the graying of the 3090.

According to responses to the DATAMATION/Cowen & Co. survey of large and midrange systems spending projections, the makeup of IBM's midrange systems base will shift from today's leader, the 4300 (55.9%), to the AS/400, which should account for an overwhelming 74% of planned 1989–1990 installations. The 9370 will barely move a muscle, edging up from a 4.7% to a 5.8% share over the next 24 months.

Although neither the AS/400 nor the 9370 is successfully displacing competitors' equipment at respondents' sites, both are pulling in new dollars. Only 1% of those planning to install either IBM midrange system says the new units will be replacing a non-IBM mini. While roughly 40% of the AS/400s are supplanting S/3Xs, another 56% are not displacing any already-installed gear.

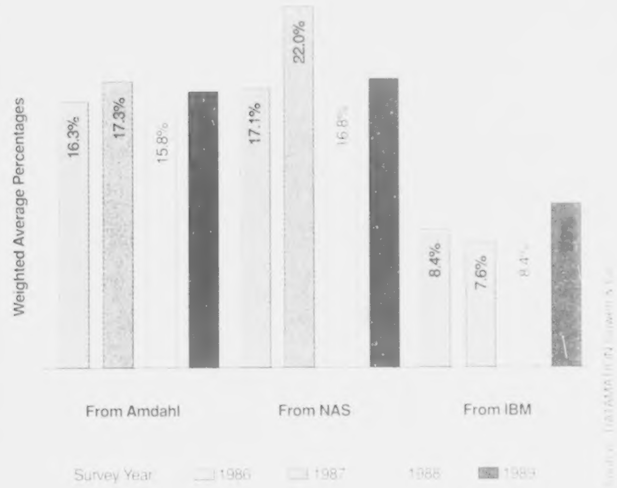
How long the upbeat news will last is hard to predict, but the numbers are not encouraging. Survey data predicting 1989 delivery installation projections on a quarterly basis show that IBM could have much of its 1989 potential AS/400 dollars in its pockets by the end of the third quarter. Only 13.3% of this year's AS/400 revenues are projected to come in the traditionally strong fourth quarter; however, the jury is still out on this issue, as customers for this class of gear ordinarily do not have their acquisition plans solidified nine to 12 months in advance of purchase. Furthermore, the survey results focus only on North America, not taking into account the strong AS/400 acceptance overseas, which represents two-thirds of IBM's S/3X base.

But it's impossible to discount the possibility that the AS/400 may have a short life ahead of it. Put into raw numbers, IBM shipped more than 25,000 AS/400s during the five-month period during which it was being delivered in 1988. Projections now call for Big Blue to ship approximately 50,000 units in 1989, meaning that, on an annualized basis, AS/400 shipments are down.

If these AS/400 predictions turn out to be true, that could spell longer term problems for IBM. Since the AS/400 appears to be the driving force behind many of this survey's positive results, IBM would need another near-term product to take up the slack. That seems improbable, as no other product line is likely to be replaced soon.

Large-System Market Discounting Rises

Most aggressive discounting is from IBM year to year



Source: DATAMATION/Cowen & Co.

a hefty 43% of the users. Forty percent of the respondents say that operating systems need more attention from Cray. This is despite the broad migration to UNICOS, Cray's UNIX-based operating system. By year-end, 65% of the respondents say that they will have converted to UNICOS.

The weighted average annual supercomputer hardware budget growth for the next three to five years stands at only 9%. Of those users planning to install the new Y-MP systems, more than two-thirds will trade in current Cray systems.

On the plus side, estimates call for still healthy 24% growth this year in Cray's customer base. This growth could be considered a sign of relief from anticipated shipment pressures.

On the local area network scene, growth is strong but moderating. By year-end 1990, 54% of the respondents say, they'll have LANs, up from the 39% using the networks today. An increasing share of LANs are carrying the Big Blue label, but IBM remains the number two supplier after Provo, Utah-based Novell Inc. Through 1990, Novell is expected to provide 40%, and IBM 38%, of the respondents' planned local networks.

The PC Mainframe Connection

Overall, 31% of installed PCs are part of networks. And a staggering 95% of those surveyed say that by next year at least some of their company's PCs will be connected with central mainframes. Perhaps because of the demand networked PCs are placing on mainframes, 45% of surveyed users say that their PCs are increasing mainframe system workloads, up four percentage points from last year. A steady 10% expect PCs to decrease the load.

More than 20% of PC dollars in 1989 will go to enhancing older systems, survey participants report. Last year that number stood at only 9.3%. And for the first time since 1985, the survey shows IBM garnering a rising share of respondents' PC purchases. A little more than 52% of respondents' installed PCs are IBMs; plans call for 55.8% of PCs bought this year to come from Big Blue.

The losers appear to be Zenith Data Systems Corp., whose share of respondent purchases dropped by a third to 6.9%, and the nonidentified "other" category, which fell from 24.7% to 21.6%. This is good news for Apple Computer Inc. and COMPAQ Computer Corp., both of which show improvements, reaping a 10% and a 5.7% unit share, respectively. Compaq, however, appears to be making little headway with its alternative to IBM's Micro Channel bus, EISA. Forty-one percent of those responding believe that Micro Channel is the long-term favorite bus architecture, compared with 8.4% for EISA. Yet, the jury is still out, considering that more than a third had no opinion.

While the apparent lack of inroads by EISA is good news for IBM, the bad news is that projected usage of OS/2 as the future PC operating system is dramatically low at 15%. The old favorite, MS-DOS, is the operating system of choice for 79% of PC users.

Notwithstanding all the frenzy surrounding UNIX in recent months, it has a long way to go in the IBM world. In fact, at IBM mainframe sites, a slightly larger number of respondents, now 72%, up from 68%, say they have absolutely no interest whatsoever in UNIX. On the flip side, those very interested increased from 7 to 9% in the last year. Unisys mainframe users are more intrigued, with 19% expressing interest in UNIX versus 16% in 1988.

Unisys midrange users are more interested in UNIX than their IBM counterparts; 30% say the operating system is "very desirable," compared with 17% in the IBM world. More than half of the IBM midrange base indicates no interest in UNIX. IBM 9370 midrange users are the most interested in UNIX, the survey reveals, while, not surprisingly, users at AS/400 sites express the least interest. And, for the time being at least, the AS/400 is king of the IBM midrange world. ▭

Survey Method

The 1989 DATAMATION/Cowen & Co. Large and Midrange Systems User Survey began during the week of January 9, 1989, when 53,585 questionnaires were mailed to mainframe systems users across the United States and Canada.

After eliminating invalid replies and multiple returns from the same user site, 2,835 completed questionnaires were tabulated. Of those, 2,288 were from IBM sites, 489 from Unisys Corp. sites, 38 from NCR Corp. sites and 20 from Cray Research Inc. sites. Respondents came from practically all segments of the economy, ranging from agriculture to transportation to nonprofit industries. The largest number of respondents came from seven fields: banking, business services, education, government, insurance, manufacturing and wholesale/retail businesses.

The Prototyping Conundrum

Prototyping is firmly rooted in a majority of development shops. It's often portrayed as a quick way to reduce software backlogs, but it's more often done to gain greater user satisfaction through improved requirements analysis.

BY J.M. CAREY AND J.D. CURREY

Prototyping: everyone wants to do it, but no one can quite agree what it is. Despite the popularity of the concept, there has been little or no consensus on the purpose of a prototype, its disposition, the benefits to be reaped or even how to conduct or control it.

Here are a few of the questions that need answers before prototyping can fulfill its promise:

What are the benefits of this development technique? To get something working quickly? To model requirements via throwaway screens? To build a permanent platform for later, more robust development?

Does prototyping actually reduce development time? Or the reverse?

How does a manager control the iterations? When is a prototype finished?

In an effort to answer these and other questions, in January 1989, we sent questionnaires to a sample of 250 companies, asking how they use prototyping as a development technique. Over 90 respondents cited experiences with more than 600 prototype development efforts.

While we do not suggest that this represents a statistically significant sample, the selected group is of value to trendspotters because it represents a cross section of *Fortune* 500 and small firms, manufacturing and service organizations, profit and not-for-profit entities and public and private users.

This population allowed us to see if the prototyping phenomenon had settled in any one environment type. The answer to this question is no; prototyping occurs in all organizational structures, regardless of company type or size.

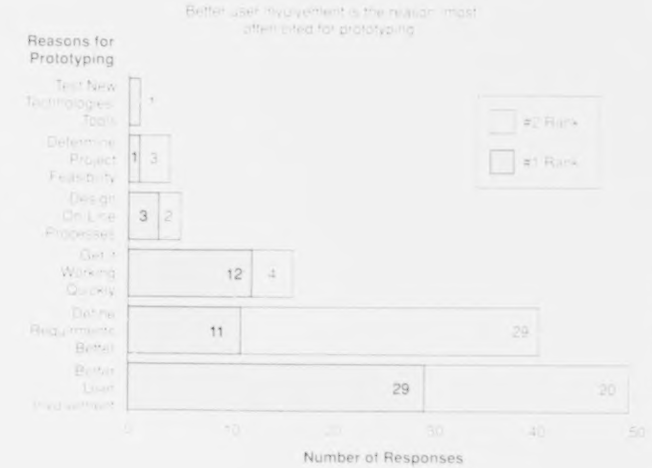
Only one prototyping factor related directly to a given kind of organization. That was average team size, which correlates directly to size of the IS function—number of analysts and programmers. Neither length of prototype duration nor availability of tools was related to size or type of organization. Similarly, prototype disposition was not related to the nature of the expanded business function.

Not everyone prototypes. About 25% of respondents said they had not yet begun to use prototyping techniques. But several of those say they plan to adopt prototyping techniques in the future. The nonprototypers described their reasons in various ways: "We don't prototype, we don't have the time" or "We have to bring up a system immediately" or "Our prototype is live."

Another theme was rooted in definition. Many people believe they are not prototyping if the user doesn't sit alongside the technical developer. Several also indicated that building a system base or platform for later development might not be considered "real" prototyping.

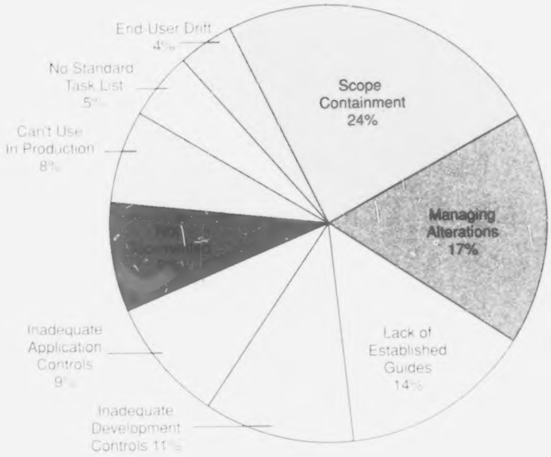
The Attractions of Prototyping

Better user involvement is the reason most often cited for prototyping



The Pitfalls of Prototyping

The biggest challenge is keeping the scope of the project under control



Source: Carey Project Organization

We noticed a strong tendency for people to downplay their prototyping experiences if they differed from the techniques espoused by popular industry theorists.

Still, most respondents prototype. Of those who do prototype, most indicated that they do so to gain the benefit of user involvement and to help users clarify requirements.

Most respondents were very clear about the benefits of prototyping. The overwhelming consideration in prototype development is the involvement of system users. Nearly all respondents cited user involvement among the top three benefits of prototyping. The word *user* appeared in 88% of the responses to the question, "What is the biggest difference between prototyping and traditional development?" Appearing with the word *user* were the words *see*, *feel*, *touch* and others with a "tangible results" connotation.

Defining True Requirements

From this emphasis on tangible results, we conclude that prototyping has become a way for the IS function to build, or model, the system in order to define requirements more accurately rather than more quickly. Prototyping is seen as the most efficient way of defining true specifications for the final application. Getting something working quickly is also an important benefit, ranked first slightly more often than defining requirements better, but the combined first and second place rankings (of a possible six places) rate speed well behind user involvement and better definition.

While more active user involvement is clearly the most significant difference in prototype development, it isn't always easy to maintain this involvement throughout the project. The need to manage customers' expectations is an imperative for successful prototyping.

The IS group also has the challenge of guarding against what William A. Cunningham, MIS director at Associated Press in New York City, calls "end-user drift." Several respondents described user frustration resulting from wanting to use the initial product as a production system; this was frequently encountered with the "toy model" approach.

When does prototyping become the best strategy? Interestingly, the most frequently encountered word in the open-ended response to this question was *all*, in two contexts: first, "all on-line development," and second, "all new development." The second most popular reason was to prototype when user expectations or requirements are not clear. Very few—less than 8%—employ risk or decision analysis criteria in deciding whether to prototype.

Respondents also suggest prototyping is typically used along with software development tools. Developers are using prototyping as a way to fully employ fourth-generation languages, data dictionaries, data bases and, to a lesser degree, computer-aided software engineering (CASE) tools. The most popular tools include high-level languages, with one-half reporting use of a 4GL. Mildly surprising was the comparatively low reported use of CASE tools: only one-fifth of the respondents who prototype say they use a CASE tool. Comments in this area suggest that the benefits of CASE technology are not yet cost-effective. The second most popular software development tool is the data dictionary, which verifies the importance of data analysis and organization in prototyping.

The ranking of 4GL, data dictionary and screen painting tools in first, second and third places, respectively, suggests that organizations are using these three basic components to build their own CASE environments, rather than expending comparatively greater resources on all-in-one CASE tools.

Not surprisingly, respondents say the prototype most often evolves through successive iterations. Their second most frequent choice is to replace prototypes with new production code, although a whopping two-thirds use software that can be used in production. A few organizations do put the resulting applications into production as is.

Experience has led us to believe that prototyping bears a clear resemblance to classical research: while the desired results can and should be stated, the actual results may be surprising. In most cases, the plan is either to put the results into production after minimal enhancement or to use the results only as a model to be replaced by a production version.

However, it does occasionally happen that the prototype is tossed out, and the project as originally envisioned is abandoned. A clear insight into discarded results was voiced by one manager: "Either the users are happy with the first iteration or they lose interest." And, sometimes, the prototype slips into production by the back door when the original intent had been to replace it with more robust, efficient code.

Among those who prototype part or all of the development effort, strong patterns emerge, particularly in terms of the problems encountered. Most prominent are the struggles against creeping scope expansion and proliferation of the number and duration of prototype iterations. Problems also exist in the areas of both application and development controls.

Poor Documentation Exists

Moreover, prototype projects generally suffer from poor documentation or a total lack thereof. All of these can be related to a tendency to forgo the application of basic management methods. This may be the source of the widely held view that prototyping is the quick and dirty way to build a system product. The reported low use of estimating guidelines for faster, smaller development efforts is perceived to be a chief contributor to the ensuing lack of control.

This lack of basic management controls is most probably rooted in the early uses of prototyping, which emerged at a time when large development methodologies were widely employed for traditional development projects. The attempt to combine the management aspects of these conservative development approaches with the more flexible, spontaneous approach required in prototyping appears to have failed, say survey respondents.

Combined with the expectation that prototype projects would last only a few weeks, this failure has caused many managers to decide against using standard management methods for prototyping. In fact, the average length of a prototype project reported in our survey is 4.25 months, which indicates that perhaps the trend away from application of management methods has swung as far as it can go, and it's now time to begin employing flexible, low-cost management methods that allow for successive iterations of the applications.

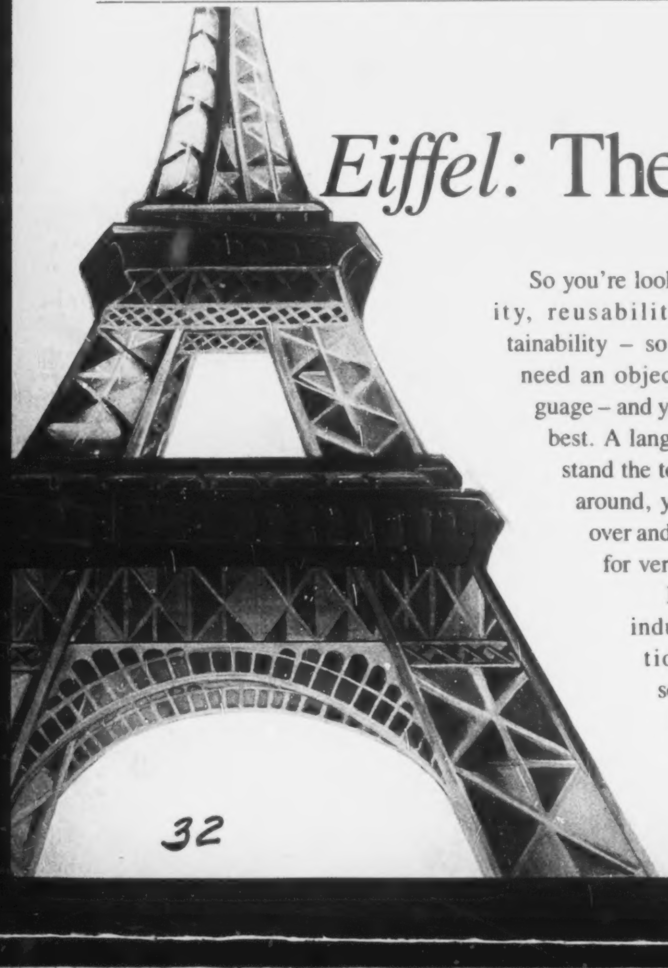
However, many practitioners agreed that controlling iterations and scope represents the crux of the problem. According to Edward Solarz, a systems development manager at Arco Chemical Co. of Newtown Square, Pa., "This is the key to making prototyping successful: manage user expectations, manage the project to meet them and try to define and contain the project's scope up front."

Most of the responses to our question about managing iterations contained the word *difficult* or variations on *no*, indicating that managers routinely experience problems in this area. Perhaps as a result, roughly 30% of respondents imply that the completion of a prototype is a very subjective matter of tail-end negotiation rather than an up-front contract.

The average reported length of a prototype development effort, at 4.25 months, is longer than we expected, and can be partly explained by the time taken to accurately define data entities and relationships as part of the prototype effort. When asked whether prototyping reduces development time, 57% said yes. Another 22% reported that projects using prototyping took the same amount of time as those built without it. Another 18% had no opinion, saying they have no firm basis for comparison, since no project was done both ways. Only 3% said that prototyping takes more time, and this group also reported more iterations than was typical. Satisfaction with the resulting documentation and control was low, demonstrating that more attention is needed during development.

More Than Four Versions

We followed up with some of the companies that mentioned problems controlling the number of iterations and indicated that development tended to take place through more than four iterations. Interestingly, two companies stated that their projects were conducted by outside consultants. Although we cannot draw a correlation between number of iterations and outside contractors, we can certainly identify the potential for more iterations when the project is in the hands of outsiders. While this longer typical



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project length looks for all the world like a clear attempt on the part of contractors to extend projects and, thus, their own contracts, it was also the case that the outside contractors were usually handed very difficult applications in business areas with vague requirements.

In these cases, both external contractors and internal practitioners tend to prototype very small portions of the system, producing more numerous and frequent deliverables: systems by the slice.

Over the past decade, there have been countless articles about prototyping in professional journals. A preponderance described prototype projects as those that you do once, with the user right beside you. Therefore, the project comes out right the first time. Or, alternately, versions are developed successively until users accept one as the final system.

What follows from the first approach is that when users see what they can have, they experience a sort of systems enlightenment. Awake to the new possibilities, they begin formulating—albeit intelligently—more frequent requests for systems. The greater the initial success, the greater the requests. The inherent failure in the latter approach is that development may never really end. So, neither of these two approaches in itself offers the glamour of fast, accurate systems development—the original basis for proceeding with a prototype.

Our survey confirms that people employ these techniques partially, rather than exclusively, and that prototyping is more elastic than rigid. We see enlightened practitioners defining to clients the benefits and trade-offs of the possible approaches and then giving the choice and options back to the customer. Development strategy varies with the needs of each individual effort.

☐ **PROTOTYPING IS BEING USED AS A WAY TO FULLY EXPLOIT FOURTH-GENERATION LANGUAGES AND DATA BASES.**

Survey results show that prototyping is rapidly gaining acceptance in corporations throughout the country and that practitioners are not following any one particular theory. While the earliest predictions were that prototyping would help develop systems faster, we see a strong trend toward the use of prototyping as a way to produce a more accurate requirements set, which leads to systems closer to users' expectations. It is these close ties to users that are a hallmark of prototype development.

The problems with prototyping tend to relate to a lack of application of basic management methods. Yet, as IS strives to meet business needs, prototyping will continue to grow as a preference for faster, more accurate systems design and definition. ▭

J.M. Carey and J.D. Currey are project management professionals with over 40 years of combined IS experience. They consult for Carey Project Organization of Ardmore, Pa., specialists in management techniques and methods for applications delivery.

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Not Just the MacMaverick Anymore?

Some market share figures and news from state-of-the-art user sites suggest that IS managers are more willing than ever to embrace the Macintosh—but they still have a technology wish list for it.

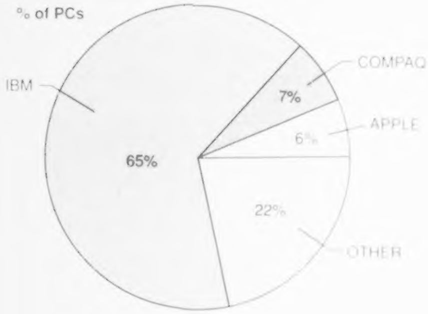
BY BOB FRANCIS

Whether it is a result of increased user sophistication in weaving together disparate systems or because of Apple Computer Inc.'s numerous new technology alliances, indications are that the Macintosh is becoming less of a bull maverick in the IS china shop and more of a welcome choice of IS managers.

"There are signs of a definite change," says Thomas Young, an analyst for the La Jolla, Calif.-based market research firm Computer Intelligence. "Although its market share in large corporations has not yet broken into double figures, and it's only a fraction of what IBM has, Apple is showing a steady gain. That's particularly interesting with a system that is incompatible with traditional MS-DOS desktop computing."

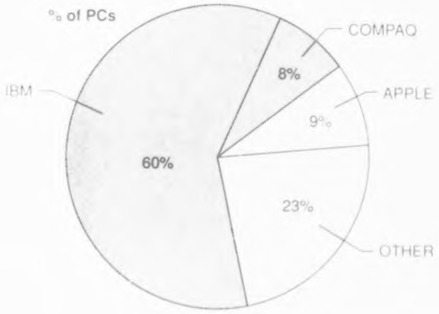
According to Young's analysis, Apple PCs currently represent 6% of all PCs gracing the desks of *Fortune* 1,000 U.S. corporations. This is up from 4% in April 1988, according to a previous survey. But, perhaps more important is the fact that Apple represents 9% of the purchases planned by those *Fortune* 1,000 companies through February 1990 (see charts). Figures from the DATAMATION/Cowen & Co. annual mini/micro survey (see "The Purchasing Outlook," November 15, 1988, p. 18) also predicted a slight

Which PCs Are Being Used Today



In 1989, Apple holds a 6% market share in *Fortune* 1,000 U.S. sites

Which PCs Will Be Used Tomorrow



Apple represents 9% of *Fortune* 1,000 PC purchases planned through February 1990

Source: Computer Intelligence

uptick in Apple's market share, from 7% of the survey's installed base in the summer of 1988 to 8% by the end of 1989. "I think that represents a clear change in attitude [toward Apple] among corporate information system directors," says CI's Young.

This change in attitude has made IS managers more inclined than ever before to pick the most appropriate technology for each application, rather than engage in a debate over vendors. "You can't tell where the new whiz-bang application is going to show up, and you can't just shut yourself out by standardizing on one architecture," says John White, senior vice president of information systems and services at Texas Instruments Inc. in Dallas. "That's just not going to happen again. If a good application comes along, we want to be ready to take advantage of it, no matter what platform it's on."

Officially, TI uses about 200 Macs, 120 of which are TI MicroExplorers, which are Mac IIs equipped with a TI Lisp chip. They are being used primarily for software development, mostly in stand-alone configurations.

The Corporate Push

This increased willingness to put an Apple in a Big Blue stable, for instance, may stem in part from Apple's amplified efforts to make it easier for the Macs to operate in a corporate IS environment by forging alliances with a number of other computer vendors (see sidebar). The companies Apple can count in its Mac technology circle today include Digital, IDEAssociates Inc., Tandem Computers Inc. and TI. To the same end, Apple also has acquired Network Innovations Corp. and Orion Network Systems Inc. Apple also has recently initiated a program to encourage independent Macintosh business software vendors to write new programs.

Apple's push for corporate acceptance was reflected at its first Macintosh Connectivity Conference held in March, which was an attempt to reach out to corporate users. Most recently, Apple has gone one step further—setting up a user organization it calls "MacIS," designed especially for *Fortune* 1,000 IS professionals.

Cheryl Currid, manager of departmental computing services at Coca Cola Foods, a Houston subsidiary of Coca Cola Co., says moves like this have increased Apple's appeal to corporate users. "What that said to us was that Apple is becoming a viable alternative product," she says. Coca Cola Foods currently uses IBM and IBM-compatible PCs but is looking into adding Apple products in the near future.

CBOT's BELDEN: Had to have a visually oriented machine

Photograph by Steve Leonard/Blackstar

CI's Young believes that IBM has created a window, allowing Apple to make inroads into Blue and Blue-compatible territory, when it introduced the PS/2 line of PCs. Because the PS/2's Micro Channel Architecture looked like a return to the days of single-vendor closed systems, many IS managers stepped back to reevaluate the whole PC market, Young says. "The introduction of PS/2 sort of made it ridiculous for MIS to say 'We're an IBM-only shop' when IBM wasn't even compatible with IBM anymore," Young says. "Corporate information managers have had to look to other solutions than traditional PCs to solve some of their problems at the low end, and obviously Apple can do that for them in some cases."

TI's White agrees. "Nobody's going back to being a one-vendor shop any longer. MIS is not going to chose a product just because one company makes it and another doesn't."

Indeed, at Oakland, Calif.-based American President Companies Ltd., Macintoshes were the only viable alternative for a system critical to the company's operations, says Harold Cypress, a Los Angeles-based consultant at Arthur D. Little Inc., who helped install the system. "We realized very quickly that the typical 3270-like terminal would not meet the needs of both the system and the users involved," he says.

"We're using it for a system that's very

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strategic, very important, for our company," says American President's James S. Marston, senior vice president and chief information officer at the containerized freight distribution and transportation company. Being installed in the company's primary distribution terminals worldwide, the Macintosh-based application uses a proprietary computer program called TACTICS (Tactical Container Terminal Information Control System), developed by company engineers.

With TACTICS, the Macintosh determines the best way to load ships with the company's containers. "This system, and the way it is going to be used, required the individual participants to deal with a number of displays simultaneously and to move information—both in text and graphical form—from one display to another for purposes of their own decision support and for passing information to others. Those requirements plus others clearly pointed to something that still doesn't exist today, but the Macintosh has come the closest," ADL's Cypress says.

Information is batch-loaded down from American President's IBM or Amdahl Corp. mainframes to the designated Macintosh fileserver. From there, other Macintoshes manipulate the material, making changes, and the new information is uploaded to the mainframes. Eventually, Marston wants to have the information running in real time on the Macintosh server. Currently, the Macintoshes are connected to the mainframes via 3270 emulation cards with a combination of coaxial and twisted pair cabling or an SNA (Systems Network Architecture) gateway device on an AppleTalk network. About 2,000 Apple computers are in use throughout the company. The TACTICS system, installed in Japan, Taiwan and the company's Seattle offices, will be expanded to many other locations by midsummer, company officials say.

Apple's Fruitful Alliances

Apple's alliances with TI and Tandem bore fruit in a system being developed by the Chicago Board of Trade (CBOT). "We're going to be using Mac for our 24-hour trading system that we'll be prototyping in September," says Glen Belden, CBOT vice president of information systems. The Macintosh machines will be connected to eight Tandem computers, used to replicate the board's pit style trading system after official business hours.

"We had to have something very visually oriented, and the Mac is a very powerful visual machine," Belden says, adding that, eventually, the CBOT system will use thousands of Macintoshes.

In designing the system, Belden used the product of the TI-Apple alliance—the TI MicroExplorer, a Macintosh II made into a low-cost artificial intelligence workstation by means of TI's Lisp chip. "I had used the Explorer [TI's Lisp workstation] before, but I decided to do this work on the MicroExplorer. So we used it to do a rapid prototyping of the application using standard programming techniques that would have taken anywhere from a year-and-a-half to two years. Here we did the specifications in two months and the simulation in another two months," Belden says.

The CBOT had already planned to make the Tandem connection itself, making Apple's agreement with Tandem a lucky fluke, Belden says. "That [agreement] assures us that the connectivity will work," he adds.

Other business-oriented technology for the Macintosh has emerged from companies that are not formally allied with Apple. IDEAssociates Inc. of Billerica, Mass., for example, produced the IDEAcomm Mac, a communications board linking the Macintosh SE with IBM minicomputers, which paid off for Bearing, Belt and Chain Co., a distribution firm in Las Vegas and beta-test site for the product.

Bearing president Steve Philpott says it was a connection he had wanted to make for some time. "We've had Macs for about two years, and I always wanted to connect them. This gave me the chance to see how it would work, so now we use the Macs for inventory control, purchasing, messaging and the like. In addition, our System/36 gets data from our primary manufacturer's IBM mainframe, so we download that data from the mainframe to the System/36 and then to our Macs. If someone orders a part, we can check and see where it is in the manufacturing process," he reports.

Taming the MacMaverick

To further enhance the perception among IS managers that Apple Computer Inc.'s Macintosh personal computers can be successfully introduced into a business environment, Apple has made several moves in the last year. These include technical alliances and acquisitions designed to provide technology crucial to business.

In order of their appearance in the market, the technical alliances were with:

- Texas Instruments Inc., Dallas., March 1988. This agreement produced the TI MicroExplorer, an Apple II machine made into a low-cost artificial intelligence workstation via TI's Lisp chip.
- Digital Equipment Corp., Maynard, Mass., August 1988. Since nearly 40% of VAX sites also use Macs, the agreement was designed to spur more development among third-party manufacturers of peripherals and software. So far, however, no new products have been generated by the alliance.
- Tandem Computers Inc., Cupertino, Calif., September 1988. This agreement allows Tandem to sell Macs as part of the company's on-line transaction-processing (OLTP) network. In addition, Tandem also agreed to develop connectivity products for the Macintosh targeted at the OLTP market. Among those products will be local area networks, data base access software, terminal emulators, host interfaces and file/print service products, says Rich Mironov, Macintosh product manager for Tandem.

The companies Apple bought in order to acquire technology were:

- Network Innovations Corp., Cupertino, Calif., March 1988. The purchase gives Apple access to CL/1 communications software, a networking language for building applications that link Macintosh users to data bases on Digital minicomputers without users having to leave Mac applications. Eventually, CL/1 will provide some connectivity links between Macs and DOS, OS/2-based PCs and IBM mainframes, says Arthur D. Little Inc. consultant Harold Cypress.
- Orion Network Systems Inc., Berkeley, Calif., June 1988. Orion's primary product, which Apple had licensed in 1985, is a Systems Network Architecture (SNA) peer communications facility that allows the Mac to exchange information with IBM systems.
- Coral Software Corp., Cambridge, Mass., January 1989. Coral markets two versions of the Lisp programming language for the Macintosh—Allegro Common Lisp and Pearl Lisp.

Jennifer M. Jacobs, an associate at the consulting firm Boston Systems Group, says that the kind of vital, strategic Mac applications being developed at American President and CBOT will eventually make their way into large businesses. "In some ways, it's the traditional story of Apple in the organization: Macs come in with desktop publishing and then eventually move to other parts of an organization. But to move into a really strategic area—to have the blessing of MIS—that's going to take a while. You just don't change an attitude overnight," she says.

In fact, despite many of the changes that have taken place over the past year with Apple and the increased interest among some MIS managers toward the company's products, plenty of challenges must be met and mastered before Macs are truly welcomed into corporate America.

IS Directors' Wish List

For example, even though American President is purchasing more Macintoshes than IBM or IBM-compatible PCs, it doesn't mean Apple has done everything the company's IS officials would like to make their system work. American President's IS staff members "have a wish list, and I think it reflects a wish list that most IS directors would like to see filled by Apple," says ADL's Cypress. On that wish list are more tools, such as computer-aided software engineering (CASE) packages, for developing Macintosh applications not only on the microcomputer but also on mini- and mainframe computers; improved connectivity between the Apple and SNA worlds; and improved LAN support.

In fact, so far, no corporate applications have been developed that truly take advantage of the Mac's capabilities. Informix Corp.'s long-awaited Wingz spreadsheet software holds some promise, according to some early users, but it's far too early to tell how that product will fare in the marketplace. In addition, it is likely, given market realities, that most graphically oriented software for the Macintosh will ultimately be ported to an MS-DOS environment, either Windows or OS/2, or to some other UNIX-based application.

"There's sort of a window of opportunity for Apple, between the time OS/2 was announced and when Presentation Manager and OS/2 really begin to take hold in the market. Who knows when that will be?" says CI's Young.

Apple also may face increasing competition from Sun Microsystems Inc., which is offering the "Sparcintosh," a machine boasting many of the ease-of-use features of the Mac at a price that puts it in competition with the high end of the Macintosh line. But Apple has countered with AUX, its own version of UNIX, which allows the Mac to handle many of the computer-aided design tasks that formerly required high-powered workstations like Sun's.

☐ For American President's Application, The Mac Comes Closest To Realizing A Technology That Doesn't Yet Exist.

Also, to make it more competitive with UNIX machines like Sun's, Apple is in the midst of rewriting its operating system so that it will be multitasking, like UNIX. "The workstation market may present some challenges, but that's also because Apple has always challenged it to some extent," says Jacobs of the Boston Systems Group.

While Apple appears to be rising to the occasion, corporate user wish lists for the Mac represent a tall order—especially for a company that until recently had consistently characterized itself as the maverick, firmly outside the Business Establishment. Early in the life of the corporation, in fact, Apple almost refused to acknowledge IBM, much less consider connecting its systems to any Blue machines. That was in 1983, when Apple was touting the Lisa computer as the solution to business needs. Things are a little different at Apple now, company officials admit.

"When we did Lisa, we were a little bit naive," admits Michael J. Homer, director of marketing at Apple U.S.A. Division. But, he adds, Apple learned a lot from the experience. "I think one thing that is different now is that we do have a mature architecture. The Lisa was an important idea. We took many of the notions around intuitive PCs and built them into a system that was not acceptable for a variety of reasons. Then we came back in 1984 and did the Macintosh. That's been the basis of our success ever since."

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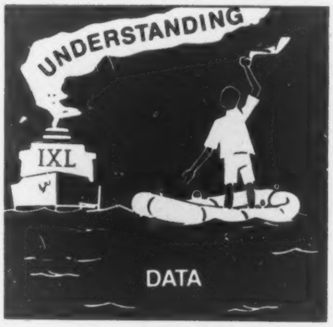

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OVERVIEW: Three Markets Shape $243 Billion Industry

DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

THE DATAMATION 100

Featuring:

Financial Data on the Top 100 U.S. Companies

Financial Data on the Top 50 International Companies

Profiles of the World's Top 100 IS Companies

Spotlights on 10 Companies That Make a Difference

Technology Insights by Global Experts

JUNE 15, 1989
VOLUME 35
NUMBER 12

DATAMATION

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THE DATAMATION 100

OVERVIEW

Three Markets Shape One Industry 6

BY JOSEPH KELLY After a decade of soaring and slumping, the IS industry is cruising nervously into the 1990s. The top 100 Asian, European and North American vendors last year sold $243.1 billion in information technology products and services. But nearly all of the industry's 16.3% growth came from buyers outside the United States.

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Cover Photography by Curt Berner

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BY DATAMATION STAFF AND CONTRIBUTORS The story told in these 100 profiles is a rich one. Revenues from these 100 vendors represent approximately 80% of the entire worldwide IS market. Ten of these companies certainly made a difference to the industry in 1988. Some outgunned everyone else. Others achieved growth via mergers and acquisitions. One even came back from the brink of disaster.

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INSIDE DATAMATION

What the DATAMATION 100 Symbolizes

Symbols powerfully express ideas when they accurately reflect the thought processes behind them. All too often these days, however, symbols are spurs only to wishful thinking: people devise tactics and execute strategies to live up to organizational symbols rather than alter these representations to fit new directions. Fortunately, DATAMATION has resisted the tug of such modern-day hype.

The triangle pictured behind the DATAMATION 100 on the cover and throughout this issue in various forms truly symbolizes the state of affairs in the worldwide information technology industry. The editors didn't arrive at this symbol until after they had thoroughly analyzed the 1988 financial results of the world's leading technology suppliers, whose revenues last year swelled 16.3% to $243.1 billion. Their discovery: the industry, far more than any of us realize, is changing rapidly from a monolithic structure dominated by U.S. vendors and buyers to a multifaceted enterprise where U.S., European and Far Eastern players share nearly equal power. The proof exists not so much in vendor revenues as in customer sales. Although U.S. vendors last year continued to hold more than 60% of the world's IS revenues, U.S. customers accounted for just 38% of all IS sales. Buyers in Europe spend nearly as much on systems as do their North American counterparts, and those in the Pacific Rim aren't far behind.

Photograph by Tom Sobolik/Blackstar

HODGES AND KELLY (r.): distilled the vital statistics.

Our reporting efforts for the DATAMATION 100 also came from three sides. In the United States, New York Bureau Manager Parker Hodges teamed up with contributing editor Joseph Kelly to extract vital financial information from hundreds of IS companies to see whether they would make the DATAMATION 100 grade, whose entry point this year rose nearly 17% to $350 million. In Europe, international editor Paul Tate, assistant Lauren Murphy and our foreign correspondents hurdled language barriers, negotiated the complexities of international currencies and prevailed over a host of other obstacles in their pursuit of the 22 European companies successful enough to join the DATAMATION 100. And in the Far East, Tokyo-based contributor Stuart Dambrot—aided by Tate in London and section editors Marsha Fisher and Gary McWilliams at the Newton, Mass., headquarters—discovered the ingredients in Japan's mix of growing IS power. Supporting their efforts was a triad of a different sort—a group of copy editors, production editors and art directors, whose efforts you see before you.

Photograph by Phillips Photography

TATE AND MURPHY (r.): put 1992 aside and focused on 1988.

Tim Mead

Tim Mead, Editor-in-Chief

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DATAMATION 100 Markets

($ Billions)		(Share of IS Market)
30.3	**MAINFRAMES**	12.5
24.1	**MINICOMPUTERS**	10.0
28.4	MICROCOMPUTERS	11.7
16.0	**DATA COMMUNICATIONS**	6.6
61.8	**PERIPHERALS**	25.4
20.8	SOFTWARE	8.6
19.8	SERVICES	8.1
28.8	MAINTENANCE	11.8
13.1	**OTHER**	5.4

Three Markets Shape One Industry

The Top 100 Asian, European and North American vendors last year sold $243.1 billion worth of information technology products and services. The industry's growth came from outside the U.S.

BY JOSEPH KELLY

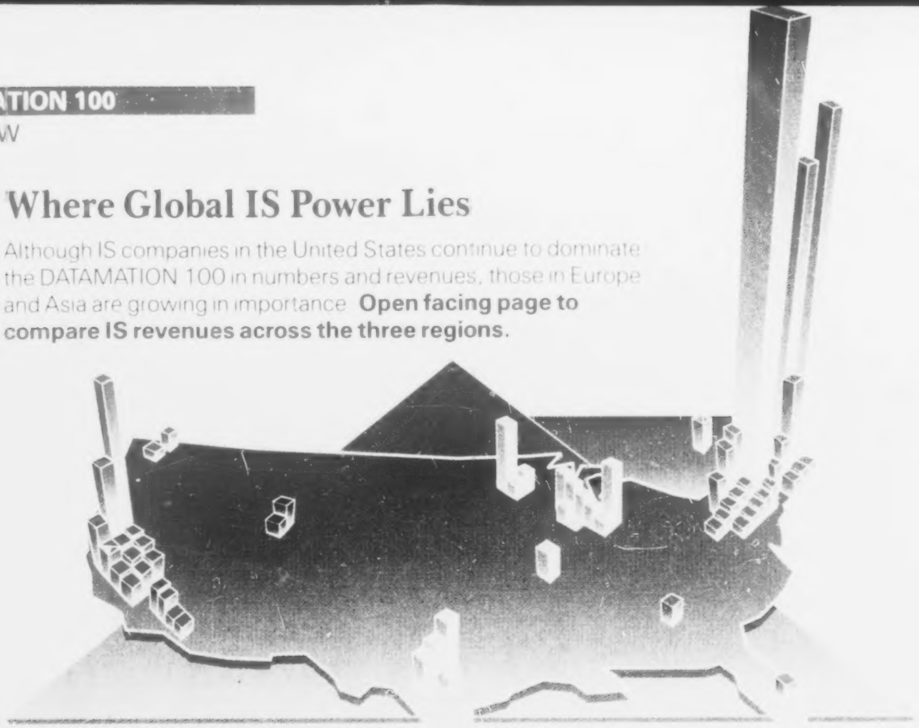
After a decade of soaring and slumping, the IS industry is cruising nervously into the 1990s. The grim words *maturity* and *consolidation* leap to more lips. Go-it-alone IBM is signing partnership agreements with competitors, some so small they'd once have had trouble getting John Akers' phone number, much less his signature on a contract. Dangerous surgery is being performed on R&D budgets. And at a time when vendors are relying on non-U.S. sales to maintain revenue growth, the coming of 1992 and a unified—perhaps protected—European market inspires fear, as well as new market strategies. Still, in 1988, with Japanese and European buyers compensating for weakness in the U.S. market, the world's 100 biggest IS companies were able to post double-digit sales and earnings increases for the second straight year.

What approval this performance merits depends on when you came in and where you came from. Strong sales in 1988's opening quarter allayed fears of a stock-market-crash-induced slowdown, but then things got dicey. While the United States sweltered through a record drought and high temperatures, the IS industry was high and dry as well without enough memory chips. Executives at IS firms scrambled to cope with the sudden shortage of their most precious component and hiked prices. Customers rebelled, and suddenly some high fliers, notably Apple Computer Inc. and Wyse Technology in the United States and Amstrad PLC in the United Kingdom, had to back off.

Turmoil in PCs made the dramatic weakness at the mainframe level all that much more apparent. Add to that a lackluster year for Digital, which has pro-

Where Global IS Power Lies

Although IS companies in the United States continue to dominate the DATAMATION 100 in numbers and revenues, those in Europe and Asia are growing in importance. **Open facing page to compare IS revenues across the three regions.**



61 North American IS Companies

Rank	Company	Location	Total Rev.
	NORTH AMERICA		
	■ CANADA		**$900.0**
56	Northern Telecom	Mississagua, Ont.	900.0
	[illegible]		[illegible]
7	Hewlett-Packard	Palo Alto	6,300.0
12	Apple	Cupertino, Calif.	4,434.1
28	Amdahl	Sunnyvale, Calif.	1,801.8
37	Sun Microsystems	Mountain View, Calif.	1,461.6
38	Tandem Computers	Cupertino, Calif.	1,424.7
40	Seagate Technology	Scotts Valley, Calif.	1,351.0
45	Computer Sciences	El Segundo, Calif.	1,253.4
52	National Semi	Santa Clara	1,018.0
60	Microsoft	Redmond, Wash.	718.6
72	Lockheed	Calabasas, Calif.	620.0
81	Wyse Technology	San Jose	488.7
83	AST Research	Irvine, Calif.	459.0
87	MAI Basic Four	Tustin, Calif.	443.3
90	Oracle	Belmont, Calif.	424.6
91	Science Applications	La Jolla, Calif.	386.0
96	Dataproducts	Woodland Hills, Calif.	364.5
98	Atari	Sunnyvale, Calif.	361.8
99	Micropolis	Chatsworth, Calif.	353.1
	[illegible]		[illegible]
58	Storage Technology	Louisville, Colo.	874.0
74	Miniscribe	Longmont, Colo.	603.3
	■ SOUTHWEST		**$6,342.6**
24	Compaq Computer	Houston	2,065.6
27	EDS	Dallas	1,907.6
29	Tandy Computer	Fort Worth	1,792.4
76	Texas Instruments	Dallas	577.0
	■ MIDWEST		**$18,551.3**
10	NCR	Dayton, Ohio	5,324.0
16	Control Data	Minneapolis	3254.3
26	TRW	Cleveland	1,965.0
39	Zenith	Glenview, Ill.	1,356.0
43	McDonnell Douglas	St. Louis	1,289.0
48	Comdisco	Rosemont, Ill.	1,212.0
49	Arthur Andersen	Chicago	1,198.5
61	Motorola	Schaumberg, Ill.	790.0
64	Cray Research	Minneapolis	756.3

vided much of the industry's excitement in recent years, and suddenly the business was abuzz with talk of another slump—and the near heretical notion that the IS industry is maturing.

The figures compiled by DATAMATION on the IS revenues of the top 100 companies in the business show total sales in 1988 of $243.1 billion, an increase of 16.3%, which is not as good as the 18.7% jump in 1987. Profits rose 15.8%—respectable, but pallid compared with the 27.2% increase posted the previous year. The quarterly performance of 10 U.S.-based IS companies tracked by DATAMATION saw year-to-year revenue growth drop two percentage points between the second and third calendar quarters before leveling off at the end of the year at 11%. (See the "IS Barometer" on page 19.)

The one trend that is clearly up—and decisively so—is the growing international nature of the business. By design or by default (certainly by necessity), the IS industry became more global than ever in 1988, pulled there by market forces, currency fluctuations and the imperative of technology itself.

International Sales Up

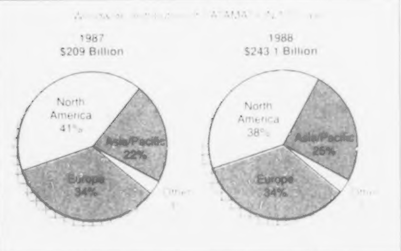
The sales slowdown in the United States together with the cheaper dollar boosted the international business of several U.S.-based IS companies. IBM, for the second year in a row, sold more abroad than it did at home. In fact, the only real sales growth Big Blue experienced came outside the United States. Altogether, 14 U.S. companies on the DATAMATION 100 derived more than half their revenues from outside the United States, including Digital, Hewlett-Packard Co., NCR Corp., Tandem Computers Inc. and Microsoft Corp. COMPAQ Computer Corp. saw its sales rise some 145% in Europe, making it one of the top 25 IS vendors there. Reliance on a weak dollar for export strength is, however, a shaky foundation for long-term planning: the spring 1989 increase in the strength of U.S. currency could weaken the overseas sales of some U.S. vendors.

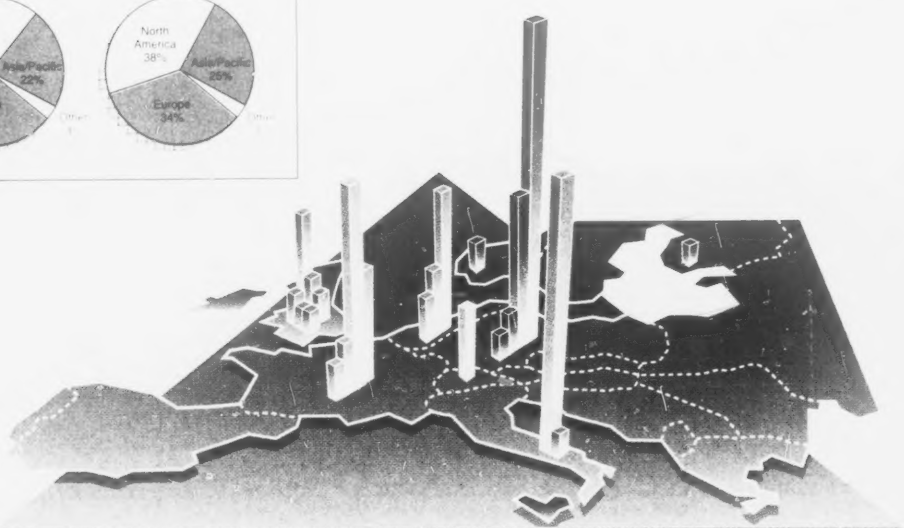
In Europe, harbingers of 1992's common-market unification have spurred a slew of cross-border alliances. European companies, accustomed to sheltered home markets, must quickly acquire the scale and the management savvy to compete on the newly open European market.

Finland-based Nokia Corp. has been the most active European company to date, acquiring the IS business of LMEricsson Telephone Co. in neighboring Sweden and moving into West Germany to pick up a television manufacturer. Siemens AG, shut out of an important telecommunications deal with Italy's Italtel, salved its wounds by participating in a bid for Britain's Plessey Co. PLC and coming to the United States to take Rolm off IBM's hands. Siemens also initiated a massive reorganization in 1988, as did Olivetti, both with essentially the same stated goal: to flatten the corporate pyramid and make the companies' responses to the marketplace more supple.

Fold out page for worldwide view. ► ► ► ►

Who Bought It





22 European IS Companies

Rank Company	Location	Total Rev.
75 3M	St. Paul	588.0
84 Anacomp	Indianapolis	455.4
97 Diebold	Canton, Ohio	362.8
[illegible]		
60 Intergraph	Huntsville, Ala.	800.2
89 Harris	Melbourne, Fla.	425.0
[illegible]		
1 IBM	Armonk, N.Y.	55,002.8
2 Digital Equipment	Maynard, Mass.	12,284.7
5 Unisys	Blue Bell, Pa.	9,100.0
17 Wang	Lowell, Mass.	3,074.4
20 Xerox	Stamford, Conn.	2,650.0
21 AT&T	New York City, N.Y.	2,445.0
33 Auto. Data Processing	Roseland, N.J.	1,617.0
34 Prime	Natick, Mass.	1,594.0
42 Data General	Westborough, Mass.	1,330.5
54 Commodore	West Chester, Pa.	926.1
55 Computer Assoc.	New York City, N.Y.	925.3
65 Martin Marietta	Bethesda, Md.	743.4
67 Continential Info. Sys.	Syracuse, N.Y.	698.4
68 General Electric	Fairfield, Conn.	675.0
70 Bell Atlantic	Philadelphia	657.0
71 Apollo Computer	Chelmsford, Mass.	653.5
80 Emhart	Hartford, Conn.	508.9
82 Lotus	Cambridge, Mass.	468.5
86 American Express	New York City, N.Y.	446.9
88 Nynex	New York City, N.Y.	430.0
93 Shared Medical Sys.	Malvern, Pa.	378.7
100 Eastman Kodak	Rochester, N.Y.	350.0
	EUROPE	
■ UNITED KINGDOM		[illegible]
22 STC	London	2,425.1
41 Atlantic Computers	London	1,341.6
59 Amstrad	Essex	841.8
77 Racal Electronics	Berkshire	554.1
95 SD-Scicon	Hampshire	366.4
94 Sema Group	London	375.1
■ THE NETHERLANDS		**$5,770.1**
19 NV Philips	Eindhoven	2,794.6
23 Memorex Telex	Amsterdam	2,078.5
57 Econocom	Amsterdam	897.0

In the United Kingdom, STC PLC, in which Northern Telecom Ltd. owns a 24% equity, bought Northern's European data terminal business, then crossed the Atlantic to snatch up the minicomputer maker Computer Consoles Inc. and the Datachecker operation of National Semiconductor Corp. The merger of Systems Designers and Scicon International in the United Kingdom created Europe's second-largest software and services house after France's Cap Gemini Sogeti, with the newly expanded Sema Group taking the third position, thanks to the merger between Sema-Metra of France and Cap Group PLC in the United Kingdom. Finsiel SpA, the Italian software and services company, and Europe Computer Systems, the leasing firm owned by the French Bank Société Générale, also grew outside their home countries, with Finsiel testing the waters in the United States.

The dangers of a vendor relying too heavily on its home market were clearly in evidence at Norsk Data AS, which reported a $41.6 million pretax loss in 1988 after losing key strategic orders to the likes of Apple, Digital, IBM and Groupe Bull. Both Norsk Data AS and Comparex Informationssysteme GmbH are leading examples of European companies that analysts believe must wean themselves from overdependence on their home bases.

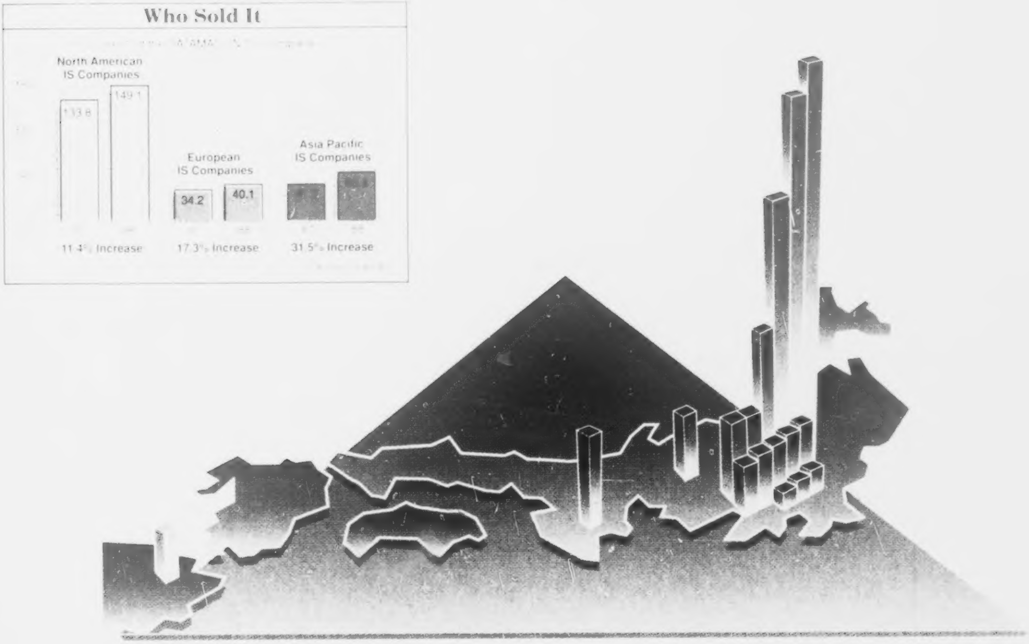
Japanese Eye Global Markets

Japanese companies are also positioning themselves in newly opening global markets. Since the mid-1980s they have been assiduously shifting manufacturing operations closer to their export markets, a trend that continued in 1988. Urgency was added by the strength of the yen and fears of potential trade restrictions in both Europe and the United States. Alps Electric Co. Ltd. announced it was building a manufacturing plant in West Germany and also expanding its operations in the United States. Both Seiko Epson Corp. and Fujitsu Ltd. announced new plants in the United Kingdom while Mitsubishi Electric Corp. announced it would establish a subsidiary with manufacturing facilities in France.

The geographic distribution of companies on the DATAMATION 100 was exactly the same as it was in 1987: 61 North American companies, 22 from Europe and 17 from Japan and the Far East. (Acer Group from Taiwan replaced Samsung Group from South Korea).

The makeup of the top 10 is also the same as last year, the year before that and (taking into account the Unisys merger) the year before that: Five U.S. companies (IBM, Digital, Unisys Corp., Hewlett-Packard and NCR); three Japanese companies (Fujitsu, NEC Corp. and Hitachi Ltd.) and two European companies (Siemens and Olivetti).

These 10 companies—with Groupe Bull waiting in the wings—make up the new global IS junta. Collectively, these ten companies controlled more than half of the total IS market in 1988, with IBM alone accounting for 22.6%. They are to the



17 Far Eastern IS Companies

Rank	Company	Location	Total Rev.
	FRANCE		**$9,211.8**
11	Groupe Bull	Paris	5,296.7
31	Alcatel	Paris	1,716.0
47	Societe Generale	Paris	1,222.6
53	Cap Gemini Sogeti	Paris	976.5
	[illegible]		
8	Siemens	Munich	5,951.0
18	Nixdorf	Paderborn	3,044.9
63	Mannesmann Kienzle	Dussledorf	779.0
73	Comparex IS	Mannheim	614.5
	SWITZERLAND		**$1,230.3**
45	Inspectorate Int'l	Neuchâtel	1,230.3
	[illegible]		
48	Nokia	Helsinki, Finland	1,165.1
85	Norsk Data	Oslo, Norway	450.2
	ITALY		**$5,973.3**
9	Olivetti	Ivrea	5,427.9
78	Finsiel	Rome	545.4
	THE FAR EAST		
	[illegible]		
3	Fujitsu	Tokyo	10,999.1
4	NEC	Tokyo	10,475.7
6	Hitachi	Tokyo	8,247.6
13	Toshiba	Tokyo	4,226.6
14	Matsushita	Osaka	3,441.0
15	Canon	Tokyo	3,391.6
25	Nihon Unisys	Tokyo	2,057.7
30	Ricoh	Tokyo	1,727.5
32	NTT	Tokyo	1,694.0
35	Seiko Epson	Nagano	1,487.7
36	Oki	Tokyo	1,472.1
44	Mitsubishi	Tokyo	1,270.7
51	C. Itoh	Tokyo	1,075.9
62	Alps	Tokyo	785.2
69	CSK Group	Tokyo	660.0
79	Sony	Tokyo	515.6
	TAIWAN		**$379.4**
92	Acer Group	Taipei	379.4

global IS market of the 1980s what IBM and the BUNCH were to the United States in the 1970s. The rise of these global IS giants has generated fears of potentially destructive trade wars. For several years, trade friction has been a staple of U.S.-Japanese relations, and both of those superpowers are watching warily to detect any inkling of "Fortress Europe" in the preparations for 1992.

Growing Global Cooperation

But focusing on the trade-war aspect of global competition may disguise another, potentially more significant trend: the growing level of global cooperation among today's largest multinational companies. According to this scenario, what the big companies really fear is not each other, but the small upstart companies in their home markets—companies that develop innovative products and grab precious market share. According to Kenichi Ohmae of McKinsey & Co., whose book *Triad Power*, published by the Free Press in 1985, describes the new style of global competition between European, Japanese and U.S. multinationals, "There is clear indication today that the top management of global enterprises are seriously interested in protecting home market positions and, if necessary, are willing to cooperate with other Triad-region competitors rather than fight them off in destructive trade wars."

Slackening demand in the United States makes an increased international focus necessary for North American IS firms. Mergers, the downsizing of corporate America, the ability to buy more computer power for less money, the continuous sniping over standards—all of these much-discussed trends have contributed to reduced growth in the U.S. market. In 1988, sales by DATAMATION 100 companies into the U.S. market grew by only 8.4%, compared with 14.5% for Europe and 29% in Asia/Pacific, including Japan. In 1988, the North American share of overall DATAMATION 100 sales slipped to 38.4% from 1987's 40.8% with almost all of that difference accounted for by the growth in Japanese demand for IS.

The decline in the popularity of big systems bears much of the blame for the contraction in the U.S. market. IBM, Control Data Corp., NCR and Unisys all posted mainframe sales that ranged from mediocre to just plain bad. In sharp contrast, the leading Japanese mainframe makers posted revenue growth in their own currency of as much as 20%. In the United States, only Amdahl Corp. could report comparable results, its processor sales rising 32.3%. Overall, the big machine's role in the IS market continued to drift downward, accounting for only 12.5% of sales last year.

Unhealthy Minis

Minicomputer sales—even including workstations—were far less healthy than anyone would have expected. In the United States, Digital was definitely off its feed, while Wang Laborato-

The DATAMATION 100 - The Leading Worldwide IS Companies

NORTH AMERICA
$14[illegible] BILLION

EUROPE
$4[illegible] BILLION

ASIA/PACIFIC
$5[illegible] BILLION

1988 Rank	COMPANY	1988 IS REVENUE
1	IBM	$55,002.8
2	Digital Equipment	12,284.7
3	Fujitsu	10,999.1
4	NEC	10,475.7
5	Unisys	9,100.0
6	Hitachi	8,247.6
7	Hewlett-Packard	6,300.0
8	Siemens	5,951.0
9	Olivetti	5,427.9
10	NCR	5,324.0
11	Groupe Bull	5,296.7
12	Apple	4,434.1
13	Toshiba	4,226.6
14	Matsushita	3,441.0
15	Canon	3,391.6
16	Control Data	3,254.3
17	Wang	3,074.4
18	Nixdorf	3,044.9
19	NV Philips	2,794.6
20	Xerox	2,650.0
21	AT&T	2,445.0
22	STC	2,425.1
23	Memorex Telex	2,078.5
24	Compaq	2,065.6
25	Nihon Unisys	2,057.7
26	TRW	1,965.0
27	Electronic Data Systems	1,907.6
28	Amdahl	1,801.8
29	Tandy	1,792.4
30	Ricoh	1,727.5
31	Alcatel	1,716.0
32	NTT	1,694.0
33	Automatic Data Processing	1,617.0
34	Prime	1,594.0
35	Seiko Epson	1,487.7
36	Oki	1,472.1
37	Sun Microsystems	1,461.6
38	Tandem Computers	1,424.7
39	Zenith	1,356.0
40	Seagate Technology	1,351.0
41	Atlantic Computers	1,341.6
42	Data General	1,330.5
43	McDonnell Douglas	1,289.0
44	Mitsubishi	1,270.7
45	Computer Sciences	1,253.4
46	Inspectorate International	1,230.3
47	Societe Generale	1,222.6
48	Comdisco	1,212.0
49	Arthur Andersen	1,198.5
50	Nokia	1,165.1
51	C. Itoh	1,075.9
52	National Semiconductor	1,018.0
53	Cap Gemini Sogeti	976.5
54	Commodore	926.1
55	Computer Associates	925.3
56	Northern Telecom	900.0
57	Econocom	897.0
58	Storage Technology	874.0
59	Amstrad	841.8
60	Intergraph	800.2
61	Motorola	790.0
62	Alps	785.2
63	Mannesmann Kienzle	779.0
64	Cray Research	756.3
65	Martin Marietta	743.4
66	Microsoft	718.6
67	Continental Information Systems	698.4
68	General Electric	675.0
69	CSK	660.0
70	Bell Atlantic	657.0
71	Apollo Computer	653.5
72	Lockheed	620.0
73	Comparex	614.5
74	Miniscribe	603.3
75	3M	588.0
76	Texas Instruments	577.0
77	Racal Electronics	554.1
78	Finsiel	545.4
79	Sony	515.6
80	Emhart	508.9
81	Wyse Technology	488.7
82	Lotus	468.5
83	AST Research	459.0
84	Anacomp	455.4
85	Norsk Data	450.2
86	American Express	446.9
87	MAI Basic Four	443.3
88	Nynex	430.0
89	Harris	425.0
90	Oracle	424.6
91	Science Applications	386.0
92	Acer Group	379.4
93	Shared Medical Systems	378.7
94	Sema Group	375.1
95	SD-Scicon	366.4
96	Dataproducts	364.5
97	Diebold	362.8
98	Atari	361.8
99	Micropolis	353.1
100	Eastman Kodak	350.0

Revenue figures are in millions of dollars.

ries Inc. and Data General Corp. were positively anemic. The big European minicomputer makers, Nokia (which acquired Ericsson's ailing IS business) and Norsk Data, both had poor years. Overall, worldwide minicomputer sales rose just 8% and account for an even 10% of the overall IS market. The area in minicomputers that bears continued watching is on-line transaction processing (OLTP) which, according to Dataquest Inc., a market research firm in San Jose, Calif., now accounts for one out of every two system sales.

Sluggish performance in the mainframe and minicomputer segments was part of the evidence cited by those who believe that IS is maturing. But for some segments of the industry, such as software, maturation actually means growth, and 1988 provided a hint of the kind of growth the industry can expect to see in the future.

Software sales rose 22.3% last year to $20.8 billion. The stellar performer here was Oracle Corp., the mainframe software company that is appearing on the DATAMATION 100 for the first time. Oracle's 114.4% growth rate was tops among companies that did not grow by acquisition—the first time a software company has achieved that distinction since Lotus Development Corp. did it in 1984.

Oracle provides a telling insight in to the future of the IS business because, as Michael Braude points out in his analysis of the software business on page 160, it successfully exploits the very things—standards, open architectures, downsizing—that bedevil established IS competitors. And Oracle seems to understand the kind of marketing clout that's needed to get its story across to customers.

The revenues of the computer services companies on the DATAMATION 100 grew a healthy 23.1% in 1988 thanks to new entrants and the growth of systems integration. Electronic Data Systems Corp. proved there is life after H. Ross Perot, posting a 32.4% sales increase and emerging as the number 1 company in services. In Europe, acquisitions and mergers fueled the rise of Cap Gemini, SD-Scicon and Sema Group, the latter two appearing on the DATAMATION 100 for the first time. Other newcomers in the services sector included American Express, which has just started to release information about its various information services subsidiaries, primarily in credit card processing; NYNEX Corp., the Bell operating company that acquired AGS Computers Inc. and became a full-fledged player in systems integration; and Science Applications International Corp., the employee-owned firm that has traditionally specialized in national security work, but which is now turning its attention to commercial systems integration and commercial software development.

Growth Spurts

The companies that grew the most in 1988

	DTM RANK	COMPANY	IS REV. IN LOCAL CURRENCY (MIL.) 1988	1987	% INCREASE
1	50	**Nokia***	Fmk4,877.0	Fmk1,835.0	165.78
2	88	**Nynex***	$430.0	$180.0	138.89
3	90	**Oracle***	$424.6	$198.0	114.44
4	37	**Sun Microsystems**	$1,461.6	$755.9	93.36
5	94	**Sema***	£210.8	£120.6	74.79
6	67	**Continental Info.***	$698.4	$405.4	72.27
7	24	**Compaq**	$2,065.6	$1,224.1	68.74
8	74	**Miniscribe**	$603.3	$362.5	66.43
9	34	**Prime Computer***	$1,594.0	$960.9	65.89
10	49	**Arthur Andersen**	$1,198.5	$748.9	60.03
11	83	**AST Research**	$459.0	$289.8	58.39
12	66	**Microsoft**	$718.6	$456.7	57.35
13	12	**Apple**	$4,434.1	$3,041.2	45.80
14	98	**Atari**	$361.8	$250.0	44.72
15	55	**Computer Assoc.***	$925.3	$648.8	42.62

Acquisitions by Nokia (Ericsson's IS business) and Nynex (AGS Computers Inc.) propelled those companies to new heights. Even without its small acquisition, Oracle outpaced Sun as the company that grew the most internally.

*Denotes a company where a merger or acquisition occurred.

Hearty Workers

IS companies with the highest revenue per employee

	DTM 100 RANK	COMPANY*	REVS. PER EMPL. ($ THOU.)	1988 IS REVS. ($MIL.)	1988 EMPLS.
1	41	**Atlantic Computers**	937.5	1,341.6	1,431
2	57	**Econocom Int'l**	607.0	971.2	1,600
3	73	**Comparex**	545.3	614.5	1,127
4	12	**Apple**	409.2	4,434.1	10,836
5	24	**Compaq**	344.3	2,065.6	6,000
6	54	**Commodore**	274.0	926.1	3,380
7	25	**Nihon Unisys**	270.2	2,057.7	7,616
8	83	**AST Research**	226.7	459.0	2,025
9	28	**Amdahl**	217.1	1,801.8	8,300
10	66	**Microsoft**	205.3	718.6	3,500
11	82	**Lotus**	182.8	468.5	2,563
12	37	**Sun Microsystems**	177.1	1,461.6	8,253
13	38	**Tandem Computers**	162.9	1,424.7	8,745
14	81	**Wyse Technology**	152.7	488.7	3,200
15	71	**Apollo Computer**	147.0	653.5	4,446

Leasing companies—Atlantic and Econocom—get the most from the least, but it's PC and workstation companies that dominate the list.

*Includes only companies with at least 95% of revenues from IS.

Despite staff defections, Arthur Andersen & Co. posted a 60% gain in worldwide revenues from systems integration and software reaching just under $1.2 billion. Among all the Big Eight firms, Arthur Andersen has the largest data services group, but it now has a new and potentially formidable competitor in the newly merged Arthur Young and Ernst & Whinney, which had combined systems integration revenues in 1988 of just under a half billion dollars. In Japan, CSK Corp. became the first big Japanese company to focus on systems integration.

Strength in Micros

But microcomputers continue to attract the most attention. Despite the memory chip shortage, worldwide sales rose a remarkable 26.8% and now account for 11.7% of overall IS sales, very nearly rivaling sales of mainframes. Compaq, Apple, Toshiba Corp. and Zenith Electronics Corp. all posted strong performances in 1988. In the United States, according to Dataquest, Apple actually surpassed IBM in PC unit market share, reflecting the lukewarm acceptance accorded the PS/2 and the premature withdrawal of the AT. Two new U.S.-based PC companies to make the DATAMATION 100 in 1988 were Atari Corp. (which does 85% of its sales in Europe) and AST Research Inc. According to Dataquest, Korean and Taiwanese companies will begin to come on strong. Acer, the largest such company to date, made the DATAMATION 100 for the first time in 1988, reporting PC sales of just under $300 million.

Top Performers

IS companies with the highest return on sales

	DTM 100 RANK	COMPANY*	1988 % RETURN ON SALES	1987 % RETURN ON SALES
1	66	**Microsoft**	21.1	20.4
2	64	**Cray Research**	20.7	21.4
3	55	**Computer Associates**	15.4	9.3
4	59	**Amstrad**	14.9	17.9
5	90	**Oracle**	14.6	15.0
6	82	**Lotus**	12.6	18.2
7†	28	**Amdahl**	12.4	9.7
8†	24	**Compaq**	12.4	11.1
9†	33	**Automatic Data Processing**	11.0	10.2
10†	60	**Intergraph**	11.0	10.9
11	2	**Digital Equipment**	9.8	12.4
12	1	**IBM**	9.7	9.5
13	12	**Apple**	9.5	9.2
14	7	**Hewlett-Packard**	8.3	8.0
15	97	**Diebold**	7.9	8.1

Top honors went to Microsoft and Cray for the third year in a row, while Amstrad, Lotus and DEC slipped from their 1987 pace.

*Includes only DTM 100 companies whose primary business is from IS (more than 75% of revenues).

†Before rounding, the 1988 % for return on sales was 12.39 at Amdahl, 12.35 at Compaq and 11.02 at Automatic Data Processing Inc.

The $61.8 billion market for peripherals was the scene of upheaval among disk-drive makers with the transition to 3½-inch drives. Micropolis Corp. earned the distinction of debuting on the DATAMATION 100 while, in the same year reporting a net loss. Two other newcomers to the DATAMATION 100 were in the magnetic media area: Eastman Kodak Co., owner of Verbatim Corp. returned to the DATAMATION 100 after a one-year absence; Anacomp Inc., better known for its computer-output microfilm business, appears on the list having bought (and now having put up for sale) the magnetic media part of Xidex Corp.'s business.

Sales of data communications equipment, including communications processors, PBXs, modems, multiplexors and the like rose only 6.7% to $16 billion in 1988. Price competition in all aspects of data communications and the continual evolution of standards kept this market in check. AT&T took a $6.7 billion charge for digitizing its network—a process the company hopes to have substantially completed by 1992. Northern Telecom also took a $200 million write-down for restructuring costs and announced a big push into Europe and Asia in an effort to overcome flat sales revenue in the tight North American market.

Maintenance revenues, an increasingly important source of income for IS companies, were essentially flat in 1988 at just under $30 billion. That figure reflects the effects of price wars unleashed by IBM. Revenues of companies in the DATAMATION 100's "other" category, which consists primarily of independent computer leasing firms in the United States and Europe, were also flat, reflecting the extremely tight conditions in that market.

Companies that dropped off the DATAMATION 100 in 1988 include Datapoint Corp., the one-time minicomputer and local area network pioneer; Tandon Corp., which has shifted from disk drives to PC clones; Tektronix Inc., slumping because of ailing terminal business; and Gould Inc., acquired in 1988 by Nippon Mining Co. Ltd. (In March, 1989, Nippon Mining sold Gould's IS business to Encore Computer Corp.)

Ten companies on the DATAMATION 100 lost money in 1988. Two minicomputer companies, Data General and Norsk Data, both suffered because of their closed architectures and Norsk's overreliance on its home market. Two disk drive makers, Micropolis and Seagate Technology, misjudged the rapid shifts in that market. Wyse was done in by the memory chip shortage and Dataproducts by the shift to laser printers. Continental Information Systems tried to grow too fast, too soon in the highly competitive leasing market, ending up in Chapter 11 bankruptcy proceedings. AT&T's massive write-off for upgrading its long-distance network devoured its profits, while Atari's loss stemmed from the write-off of its disastrous foray into computer retailing.

The swelling concern over junk-bond mergers—one of the biggest business stories of 1988—was not a big factor in IS. In the United States, big acquisitions were in computer-aided design and manufacturing (CAD/CAM) with Prime Computer Inc.'s purchase of both Computervision Corp. and part of General Electric's Calma Co. business. Another large IS acquisition was Computer Associates International Inc.'s purchase of Applied Data Research Inc. from Ameritech Corp. Hewlett-Packard's purchase of Apollo Computer Inc. gives HP first place in the evolving workstation market. In Europe, the biggest deal was Nokia's purchase of Ericsson's undernourished IS operations.

Missing Links

Among the most interesting linkups were those that didn't happen: NCR was said to be a target, first of Unisys and then of AT&T. Apple and Cray Research Inc. were proposed by some as an ideal match, as were Wang and Xerox Corp. The takeover threat prompted Xerox to restructure and refocus its marketing, particularly of its publishing systems; takeover talk was also an impetus behind Lockheed Corp.'s decision to put its IS businesses on the block. To come, of course, is the denouement of the long-running MAI Basic Four Inc. attack on Prime.

While merger mania did not take hold in IS, critics view a slackening commitment to R&D as emblematic of the same short-term, get rich quick outlook. Although R&D spending rose overall by

Big Returns

The companies with the highest return on assets

	DTM 100 RANK	COMPANY*	1988 % RETURN ON ASSETS	1987 % RETURN ON ASSETS
1	41	**Atlantic Computers**	31.3	52.7
2	59	**Amstrad**	30.4	46.6
3	66	**Microsoft**	25.0	32.3
4	91	**Science Applications**	24.0	8.4
5	90	**Oracle**	18.5	16.0
6	12	**Apple**	18.4	17.3
7	24	**Compaq**	16.1	15.1
8	64	**Cray Research**	15.8	16.3
9	82	**Lotus**	14.0	22.7
10	55	**Computer Associates**	12.3	7.7
11	2	**Digital Equipment**	11.8	13.6
12	78	**Finsiel**	11.7	15.6
13	28	**Amdahl**	11.6	9.7
14	27	**Electronic Data Systems**	11.2	10.9
15†	33	**Automatic Data Processing**	11.2	9.4

Leasing, software and services companies dominate this list. Both Microsoft and Lotus were down significantly from 1987.

*Includes only DTM 100 companies whose primary business is from IS (more than 75% of revenues).

†Before rounding, ROA at Electronic Data Systems was 11.24 and Automatic Data Processing was 11.19.

nearly 15%, the typical R&D commitment by U.S. DATAMATION 100 firms dropped a full percentage point from 10.9% of total revenue to 9.9%. This shrinking commitment to R&D comes at a time when Japanese firms are redeploying their R&D activities on a global basis. NEC opened its NEC Research Institute in Princeton, N.J., in 1988, and Epson, Hitachi and Canon Inc. have all indicated plans to establish R&D centers in the United States and Europe. Among U.S. IS companies, only IBM has a significant R&D presence worldwide, but there are signs that situation may be changing. Recent studies by the National Science Foundation show that R&D spending by U.S. companies is increasing more abroad than it is at home.

At the beginning of the 1980s, when the United States was both the biggest and the fastest-growing IS market, a U.S. strategy was a global strategy. But that's not the case now. The world simply doesn't work that way any more.

Methodology

Throughout the year, DATAMATION collects information on more than 200 companies on a worldwide basis. The companies are then ranked on the basis of their IS revenues for the calendar year. All revenue and earnings figures in the current DATAMA-

In the Red

Ten that lost money

	DTM 100 RANK	COMPANY	1988 EARNINGS LOSS ($ MIL.)
1	21	**AT&T**	1,669.0
2	98	**Atari**	84.8
3	42	**Data General**	48.9
4	85	**Norsk Data**	41.6
5	99	**Micropolis**	19.4
6	52	**National Semiconductor**	18.1
7	96	**Dataproducts**	11.3
8	67	**Continental Info. Sys.**	10.8
9	81	**Wyse Technology**	6.9
10	40	**Seagate Technology**	5.5

Write-offs sent AT&T and Atari into the red. Data General repeats for the third time and Data Products for the second. Continental is in Chapter 11 bankruptcy proceedings.

Shakeout in the Computer Industry?

BY KENNETH FLAMM

The computer industry's recent slowdown has inspired some observers to predict a major consolidation and restructuring in the industry. According to the basic logic behind this prediction, the era of extraordinarily high growth rates is coming to an end and, with the onset of maturity, the industry must realign itself into a much smaller number of bigger, leaner and meaner companies. According to this view, the slowdown signals a much broader and profound shakeout to come. I do not believe this to be the case; in my view, there are four mitigating points to consider.

First of all, the computer industry has always coasted up and down with the business cycle. Currently, businesses are holding back on capital investment amidst widespread uncertainty over whether a recession may occur in the latter part of this year. But the current slump is no worse than those seen in the past and is arguably less severe. In the 1981 downturn, for example, U.S. computer equipment sales grew only 2.3% after inflation. Typically, foreign markets cushion the impact of a domestic downturn. For example, in 1981 direct imports rose to 28% of total U.S. shipments compared with 26% in 1979 and 1982.

Second, in 1988 extraordinary increases in the price for dynamic random access memory (DRAM) chips—courtesy of Japan's Ministry of International Trade and Industry, the U.S. Department of Commerce and a confused U.S. trade policy—resulted in system prices that were flat or even rose somewhat. Those flat prices were a sharp contrast to the normal 20%-plus annual decline in quality-adjusted system cost. Since computer demand is quite price sensitive (economists suggest a price elasticity of 1.5—i.e., that a 10% increase in price causes a 15% decline in demand), this clearly put a considerable damper on computer demand. Accustomed to yearly sales increases of 20 to 30%, many companies did not correctly predict the impact of flat pricing on their sales.

Third, the computer industry is going through a period of great uncertainty. Nonproprietary international standards like UNIX have now become firmly established and may soon become the major force in the industry's continued evolution. At the time, however, uncertainties about standards are a giant headache for consumers. UNIX or OS/2, MicroChannel or EISA—these are just a few of the choices that a high-end PC consumer must consider. Not a few users are postponing their purchases and letting someone else make the mistakes until the market's direction is clearer. All of these new systems, incidentally, are much more memory intensive than older technology, and the increase in DRAM prices motivated some users to defer purchasing new systems.

Finally, the fundamental factor driving the double-digit growth of the computer industry has been the continuing steep decline in the cost of computing capacity. This radical decline in price has created new demands for computing in new applications. There is no obvious reason—our misguided trade policy notwithstanding—why the decline in memory and processor cost that has propelled computer prices downward should not continue indefinitely. This would create new markets and new opportunities for small start-ups to earn their spurs by creating innovative products. Indeed, the growing role of nonproprietary industry standards suggests that it should become easier to enter the market and that the computer industry should grow more competitive, not less. Today, you don't need to produce an entire system to become a player, you merely need to build one small piece of it better than anyone else. Nonproprietary standards guarantee a ready market out there for a better mousetrap—one that others can integrate into their systems.

Kenneth Flamm, an economist specializing in high-technology industries, is a senior fellow at The Brookings Institution, Washington, D.C. He is the author of Creating the Computer: Government, Industry and High Technology *(Brookings, 1988); and* Targeting the Computer: Government Support and International Competition *(Brookings, 1987).*

TION 100 are for calendar year 1988. Because many companies operate on a fiscal year that does not coincide with the calendar year, some data, such as expenditures on research and development, are reported as of the company's most recent fiscal year-end.

For the purposes of the DATAMATION 100 survey, data-processing revenues are defined as being derived from sales of the following: computer systems, including mainframes, minicomputers, microcomputers, personal computers, workstations, word processors, office systems and CAD/CAM systems; peripherals, including terminals, printers, plotters, disk drives, tape drives, magnetic media and data entry devices; software, including operating systems and applications programs; data communications equipment, including communications processors, local area networks, digital PBXs, multiplexors, modems and facsimile machines; data services, including custom programming, systems integration, consulting, time-sharing and remote processing; maintenance and repair; computer leasing; point-of-sale systems; and automatic teller machines.

Explicitly excluded are the following: data transmission or "basic" services from specialized common carriers that are not integrated with a data-processing service; stand-alone electronic or mag card typewriters; stand-alone electronic cash registers; instrumentation; semiconductors; printed circuit boards; automatic test equipment; DP supplies, with the exception of magnetic media for disk and tape drives; industrial control devices; central office telephone switches; analog PBXs; and computer-output-micrographic systems.

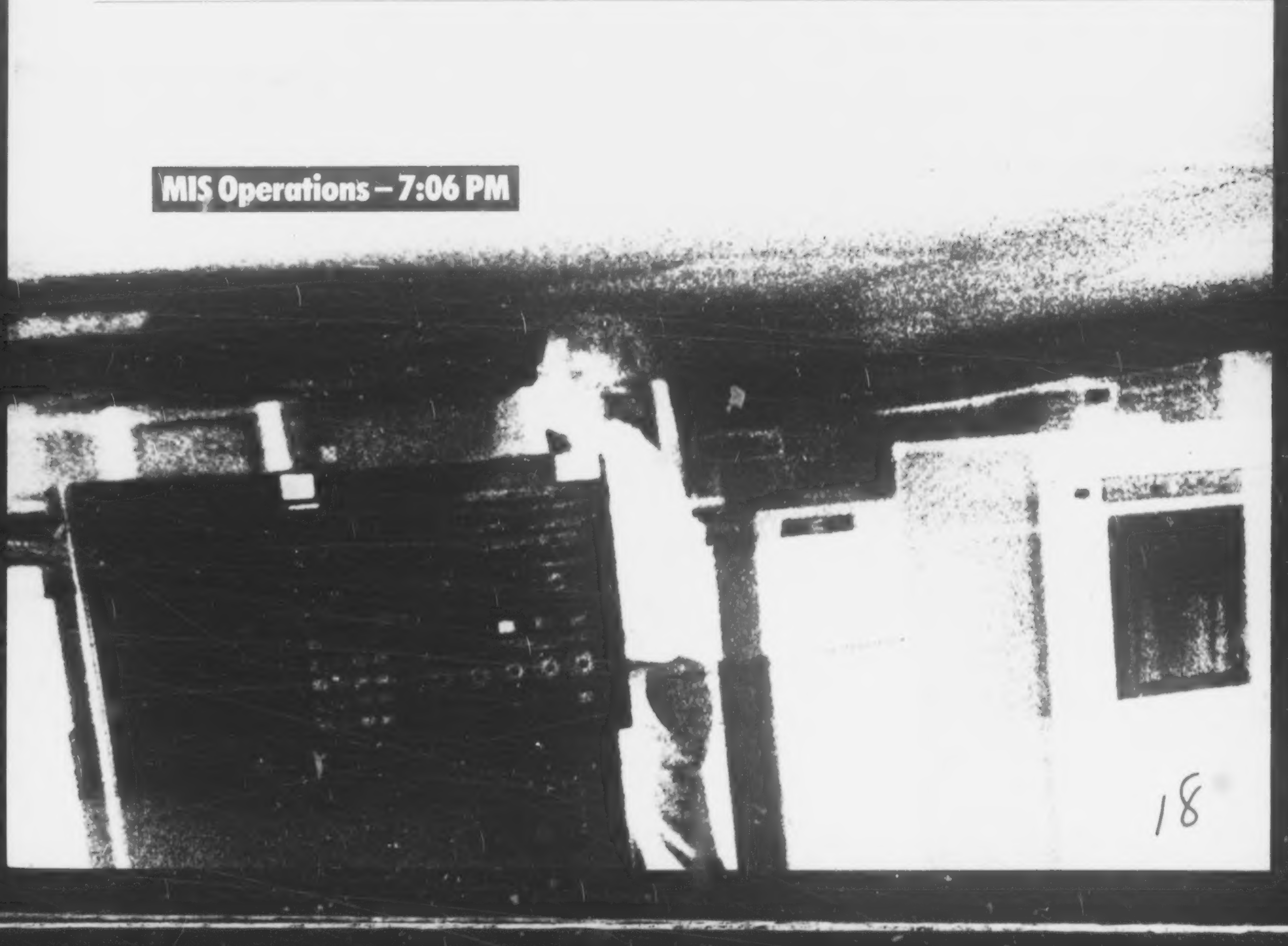
Figures listed in the DATAMATION 100 for mainframes and minicomputers represent only the sale of the processor itself; figures for peripherals and software that are sold as part of a system are grouped into the peripherals and software categories.

Whenever possible, information in the DATAMATION 100 is obtained from the companies themselves. When a company will not provide information, or will not provide it in a form suitable for this survey, we have estimated the figures based on investiga-

Falling Fortunes

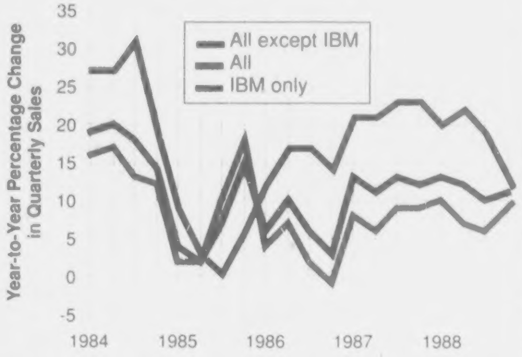
Ten companies that couldn't keep up in IS

	DTM 100 RANK	COMPANY	IS REV. IN LOCAL CURRENCY (MIL.) 1988	1987	% DECREASE
1	31	Alcatel	ECU1,450.0	ECU1,780.0	18.54
2	109	Tandon	$309.3	$374.0	17.30
3	68	General Electric	$675.0	$750.0	10.0
4	118	Gould	$275.0	$299.3	8.12
5	77	Racal Electronics	£311.4	£335.8	7.27
6	89	Harris	$425.0	$446.0	4.71
7	93	Shared Medical	$378.7	$390.7	3.07
8	46	Inspectorate Int'l	SFr1,800.0	SFr1,835.3	1.92
9	84	Anacomp	$455.4	$455.7	0.07



IS Barometer: How 10 Leading Companies IS Sales Are Faring*

1988 started strong, but never lived up to first-quarter perfomance.



*Based on ten leading companies with revenues predominantly from IS: Amdahl, Apple, Commodore, Data General, Digital Equipment, IBM, NCR, Prime, Tandem, Wang.

tive reporting and an analysis of industry trends.

The net income reported for each company represents total earnings, not just earnings from data-processing revenues. Revenues derived from sales to other divisions or units within a company are considered captive sales and are not included in this survey.

Results for non-U.S. companies are converted into dollars using the Organization of Economic Cooperation and Development (OECD) average exchange rates. For those currencies not part of the OECD, exchange rate information was provided by the International Monetary Fund.

For 1988, equivalents to one dollar in these currencies were the following: European Currency Unit, ECU0.8450; Finland, Fmk4.1860; France, Fr5.9560; Italy, L1301.6820; Japan, ¥128.1500; the Netherlands, G1.9770; Norway, NKr6.5170; Sweden, SKr6.1290; Switzerland, SFr1.4630; Taiwan, TD28.636; the United Kingdom £0.5620; West Germany, DM1.7560; South Korea, W731.4700.

For 1987, equivalents to one dollar in these currencies were the following: European Currency Unit, ECU0.87; Finland, Fmk4.40; France, Fr6.01; Italy, L1296.97; Japan, ¥144.62; the Netherlands, G2.03; Norway, NKr6.74; Sweden, SKr6.34; Switzerland, SFr1.50; Taiwan, D31.76; the United Kingdom, £0.61; West Germany, DM1.80; South Korea, W822.57.

DATAMATION would like to thank the following for providing information used in the DATAMATION 100: Daratech Inc., Cambridge, Mass; Dataquest Inc., San Jose, Calif.; First Boston Corp., New York City; Future Computing Inc., Richardson, Texas; International Technology Group, Los Altos, Calif; Merrill Lynch, New York City; Northern Business Information, New York City; Sanford C. Bernstein & Co., New York City; Santa Clara Consulting Group, Santa Clara. Calif; Smith Barney, Harris Upham & Co., New York City. ▭

Situation: Critical

"...37 new sites in 4 regions dumped in my lap... and they want my recommendation by tomorrow? Who're they kidding?... Means we've got to decentralize... Distribute the application... Build a high integrity network... Add processing power. We've got to be on-line in how long? Five months? And put it all together without losing a single transaction?... Who can I put on it? And what, God forbid, if the computer goes down?"

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The 100 Leading U.S. IS Companies

1988 US RANK	1988 WORLD RANK	1987 WORLD RANK	COMPANY	1988 IS REVENUE	1987 IS REVENUE	IS REV % CHANGE	1988 TOTAL REVENUE	IS AS % OF TOTAL REVENUE
1	1	1	IBM	55,002.8	50,614.0	8.7	59,681.0	92.2
2	2	2	Digital Equipment	12,284.7	10,391.3	18.2	12,284.7	100.0
3	5	3	Unisys	9,100.0	8,900.0	2.3	9,902.0	91.9
4	7	9	Hewlett-Packard	6,300.0	5,000.0	26.0	9,831.0	64.1
5	10	8	NCR	5,324.0	5,087.0	4.7	5,989.9	88.9
6	12	14	Apple	4,434.1	3,041.2	45.8	4,434.1	100.0
7	16	15	Control Data	3,254.3	2,975.9	9.4	3,628.3	89.7
8	17	13	Wang	3,074.4	3,045.7	0.9	3,074.4	100.0
9	20	19	Xerox	2,650.0	2,415.0	9.7	16,441.0	16.1
10	21	24	AT&T	2,445.0	2,000.0	22.3	35,210.0	6.9
11	23	36	Compaq	2,065.6	1,224.1	68.7	2,065.6	100.0
12	25	25	TRW	1,965.0	1,960.0	0.3	6,982.1	28.1
13	26	30	Electronic Data Systems	1,907.6	1,440.5	32.4	4,844.1	100.0
14	27	28	Amdahl	1,801.8	1,505.2	19.7	1,801.8	100.0
15	28	26	Tandy	1,792.4	1,692.4	5.9	3,992.3	44.9
16	32	29	Automatic Data Processing	1,617.0	1,467.0	10.2	1,617.0	100.0
17	33	50	Prime	1,594.0	960.9	65.9	1,594.0	100.0
18	36	55	Sun Microsystems	1,461.6	755.9	93.4	1,461.6	100.0
19	37	42	Tandem Computers	1,424.7	1,089.6	30.8	1,424.7	100.0
20	38	46	Zenith	1,356.0	1,040.0	30.4	2,685.7	50.5
21	39	43	Seagate Technology	1,351.0	1,075.7	25.6	1,351.0	100.0
22	41	31	Data General	1,330.5	1,303.9	2.0	1,330.5	100.0
23	42	34	McDonnell Douglas	1,289.0	1,237.0	4.2	15,072.0	8.6
24	44	40	Computer Sciences	1,253.4	1,133.8	10.6	1,253.4	100.0
25	47	38	Comdisco	1,212.0	1,153.0	5.1	1,356.0	89.4
26	48	58	Arthur Andersen	1,198.5	748.9	60.0	2,976.5	40.3
27	52	48	National Semiconductor	1,018.0	985.0	3.4	2,666.8	38.2
28	55	54	Commodore	926.1	785.0	18.0	964.7	96.0
29	56	66	Computer Associates	925.3	648.8	42.7	925.3	100.0
30	58	57	Storage Technology	874.0	750.0	16.5	874.0	100.0
31	60	67	Intergraph	800.2	641.1	24.8	800.2	100.0
32	61	60	Motorola	790.0	724.9	9.0	8,250.0	9.6
33	64	61	Cray Research	756.3	687.3	10.0	756.3	100.0
34	65	63	Martin Marietta	743.4	685.7	8.4	5,727.5	13.0
35	66	76	Microsoft	718.6	456.7	57.4	718.6	100.0
36	67	84	Continental Information Systems	698.4	405.4	72.3	776.3	90.0
37	68	56	General Electric	675.0	750.0	(10.00)	50,089.0	1.3
38	70	68	Bell Atlantic	657.0	634.9	3.5	10,880.1	6.0
39	71	72	Apollo Computer	653.5	553.6	18.1	653.5	100.0
40	72	73	Lockheed	620.0	553.0	12.1	10,590.0	5.9
41	74	94	Miniscribe	603.3	362.5	66.4	603.3	100.0
42	75	78	3M	588.0	455.0	29.2	10,000.0	5.9
43	76	71	Texas Instruments	577.0	555.0	4.0	6,295.0	9.2
44	80	85	Emhart	508.9	404.8	25.8	2,762.5	18.4
45	81	87	Wyse Technology	488.7	396.2	23.4	488.7	100.0
46	82	88	Lotus	468.5	395.6	18.4	468.5	100.0
47	83	104	AST Research	459.0	289.8	58.4	459.0	100.0
48	84	77	Anacomp[1]	455.4	455.7	(0.1)	482.7	NA
49	86	91	American Express	446.9	383.8	16.4	22,934.0	1.9
50	87	96	MAI Basic Four	443.3	334.2	32.7	443.3	100.0

All currency figures are in millions. NA = not available or not applicable.

[1] Anacomp [illegible]

1988 EMPLOYEES	% CHANGE FROM 1987	IS REV PER EMPL ($THOU)*	R&D CORP 1988	R&D AS % OF TOT REV	NET INCOME	% RETURN ON ASSETS	FISCAL YEAR END	LOCATION
387,112	(0.6)	154.2†	5,925.0	9.93	5,806.0	8.0	Dec.	N.Y.
124,400	6.5	98.8	1,447.5	11.78	1,209.1	11.8	July	Mass.
93,000	0.5	106.5†	1,419.5	14.34	680.6	5.9	Dec.	Pa.
87,000	6.1	113.0†	1,019.0	10.37	816.0	10.9	Oct.	Calif.
60,000	(3.2)	99.8†	416.0	6.95	439.3	9.3	Dec.	Ohio
10,836	49.9	409.2	315.2	7.11	419.3	18.4	Sept.	Calif.
33,657	(2.4)	107.8†	394.3	10.87	1.7	0.1	Dec.	Minn.
31,255	1.3	98.4	250.3	8.14	50.1	1.7	June	Mass.
100,123	1.1	164.2†	794.0	4.83	388.0	1.5	Dec.	Conn.
304,200	0.4	115.7†	2,572.0	7.30	(1,669.0)	NA	Dec.	N.Y.
6,000	50.0	344.3	74.9	3.63	255.2	16.0	Dec.	Texas
73,211	(6.1)	95.4†	1,879.0	26.91	260.6	5.9	Dec.	Ohio
50,407	16.1	96.1†	NA	NA	384.1	11.2	Dec.	Texas
8,300	9.2	217.1	221.0	12.27	223.3	11.6	Dec.	Calif.
37,000	2.8	107.9†	NA	NA	121.5	4.2	June	Texas
22,000	0	73.5	74.6	4.61	178.2	11.2	June	N.J.
12,500	41.8	127.5	174.0	10.92	19.0	1.2	Dec.	Mass.
8,253	51.0	177.1	191.8	13.12	89.6	9.2	June	Calif.
8,745	21.9	162.9	179.6	12.61	102.1	7.7	Sept.	Calif.
36,000	2.9	74.6†	100.6	3.75	11.7	0.8	Dec.	Ill.
26,000	10.7	52.0	56.7	4.20	(5.5)	NA	June	Calif.
14,810	(5.3)	89.8	164.2	12.34	(48.9)	NA	Sept.	Mass.
121,421	8.0	124.1†	610.0	4.05	350.0	2.9	Dec.	Mo.
19,800	7.6	63.3	NA	NA	49.5	6.9	Mar.	Calif.
1,503	33.0	902.2†	NA	NA	96.0	2.8	Sept.	Ill.
48,000	20	62.0†	300	NA	NA	NA	Aug.	Ill
39,000	2.6	68.4†	302.2	11.33	(18.1)	NA	May	Calif.
3,380	7.3	274.0	19.4	2.01	69.6	10.2	June	Pa.
6,400	60.0	144.6	110.0	11.89	142.4	12.3	Mar.	N.Y.
8,900	0.4	98.2	67.5	7.72	44.2	5.2	Dec.	Colo.
7,300	31.9	109.6	89.2	11.15	88.0	10.6	Dec.	Ala.
102,000	4.4	80.9†	665.0	8.06	445.0	6.6	Dec.	Ill.
5,237	21.6	144.4	117.8	15.58	156.6	15.8	Dec.	Minn.
67,500	(0.7)	84.9†	194.9	3.40	358.9	10.8	Dec.	Md.
3,500	75.4	205.3	87.3	12.15	151.4	25	June	Wash.
1,100	22.2	705.7†	0.0	0.00	(10.8)	NA	Feb.	N.Y.
298,000	(7.4)	168.1†	1,155.0	2.31	3,386.0	3.0	Dec.	Conn.
81,000	0.1	134.3†	NA	NA	1,316.8	5.3	Dec.	Pa.
4,446	11.4	147.0	76.9	11.77	2.1	0.4	Dec.	Mass.
86,800	(12.6)	122.0†	536.0	5.06	624.0	9.4	Dec.	Calif.
6,648	33.7	90.7	18.7	3.10	25.9	5.3	Dec.	Colo.
82,405	0	121.4†	650.0	6.50	1,154.0	12.9	Dec.	Minn.
75,000	(3.8)	83.9†	494.0	7.85	366.3	8.3	Dec.	Texas
32,991	8.0	83.7†	41.0	1.48	126.6	5.2	Dec.	Conn.
3,200	(11.1)	152.7	32.2	6.59	(6.9)	NA	Mar.	Calif.
2,563	20.9	182.8	83.8	17.89	58.9	14.0	Dec.	Mass.
2,025	32.8	226.7	17.4	3.79	4.3	1.6	June	Calif.
9,000	NA	NA†	NA	NA	32.8	3.4	Sept.	Ind.
100,000	17.6*	229.3†	NA	NA	1,038.0	0.7	Dec.	N.Y.
4,285	27.2	103.5	24.5	5.53	24.3	5.9	Sept.	Calif.

*For companies with more than 95% of revenues from IS

†Based on total corporate revenues

The 100 Leading U.S. IS Companies

1988 US RANK	1988 WORLD RANK	1987 WORLD RANK	COMPANY	1988 IS REVENUE	1987 IS REVENUE	IS REV % CHANGE	1988 TOTAL REVENUE	IS AS % OF TOTAL REVENUE
51	88	154	NYNEX	430.0	180.0	138.9	12,660.8	3.4
52	89	79	Harris	425.0	446.0	(4.8)	2,104.8	20.2
53	90	142	Oracle	424.6	198.0	114.4	424.6	100.0
54	91	99	Science Applications	386.0	309.0	24.9	865.4	44.6
55	93	89	Shared Medical Systems	378.7	390.7	(3.1)	378.7	100.0
56	96	97	Dataproducts	364.5	334.2	9.1	364.5	100.0
57	97	95	Diebold	362.8	345.5	5.0	450.6	80.5
58	98	118	Atari	361.8	250.0	44.7	452.6	79.9
59	99	105	Micropolis	353.1	288.3	22.5	353.1	100.0
60	100	103	Eastman Kodak	350.0	290.0	20.7	17,034.0	2.1
61	102	204	Concurrent Computer[2]	342.0	80.8	323.3	342.0	100.0
62	103	123	Maxtor	339.0	239.4	41.6	339.0	100.0
63	104	98	Datapoint	333.3	320.7	3.9	333.3	100.0
64	107	121	Ernst & Whinney	315.0	242.0	30.2	2,191.0	14.4
65	108	145	3Com	309.9	197.5	56.9	309.9	100.0
66	109	92	Tandon	309.3	374.0	(17.3)	309.3	100.0
67	110	110	Ashton-Tate	307.3	267.3	15.0	307.3	100.0
68	111	139	Novell	306.8	202.1	51.8	306.8	100.0
69	112	129	Mentor Graphics	300.8	221.8	35.6	300.8	100.0
70	113	134	Everex Systems	298.6	210.1	42.1	298.6	100.0
71	115	101	Tektronix	292.2	295.4	(1.1)	1,431.0	20.4
72	116	116	Gerber Scientific	288.4	254.8	13.2	288.4	100.0
73	118	100	Gould[3]	275.0	299.3	(8.1)	NA	NA
74	119	111	Boeing	274.0	266.3	2.9	16,962.0	1.6
75	120	107	Genicom	273.9	284.9	(3.9)	291.4	94.0
76	121	122	Schlumberger	270.0	240.0	12.5	4,924.0	5.5
77	123	152	Stratus	265.3	184.1	44.1	265.3	100.0
78	124	128	Bolt Beranek and Newman	265.0	223.1	18.8	302.1	87.7
79	126	113	Recognition Equipment	261.5	265.2	(1.4)	261.5	100.0
80	128	171	Dell Computer	257.8	159.0	62.1	257.8	100.0
81	129	130	Intel	255.0	220.0	15.9	2,874.8	8.9
82	130	124	Reynolds & Reynolds	251.2	237.9	5.6	605.4	41.5
83	131	115	Management Science America	250.0	258.5	(3.3)	250.0	100.0
84	132	151	Decision Data	240.0	191.4	25.4	240.0	100.0
85	136	158	Touche Ross	235.0	175.0	34.3	1,840.0	12.8
86	137	141	Price Waterhouse	230.0	200.0	15.0	2,200.0	10.5
87	138	140	Digital Communications	226.5	200.6	12.9	226.5	100.0
88	139	164	Computer Task Group	218.7	170.1	28.6	218.7	100.0
89	140	155	Policy Management Systems	216.9	180.0	20.5	216.9	100.0
90	141	159	American Management Systems	213.5	174.3	22.5	213.5	100.0
91	142	136	Cullinet	211.5	203.9	3.4	211.5	100.0
92	143	161	Cipher Data Products	206.5	172.6	19.6	206.5	100.0
93	144	143	The Ultimate Corp.	203.9	197.7	3.1	203.9	100.0
94	145	144	General DataComm	203.2	197.7	2.8	203.2	100.0
95	146	162	Dun & Bradstreet	200.0	171.0	17.0	4,267.4	4.7
96	147	163	National Data	197.3	170.2	15.9	197.3	100.0
97	148	168	Systematics	197.0	163.5	20.5	197.0	100.0
98	149	180	Pansophic Systems	189.1	145.2	30.2	189.1	100.0
99	150	157	HBO	187.4	175.2	7.0	187.4	100.0
100	151	202	Wordperfect	178.7	100.3	78.1	178.7	100.0

[illegible]

[illegible]

[illegible]

1988 EMPLOYEES	% CHANGE FROM 1987	IS REV PER EMPL ($THOU)*	R&D		NET INCOME	% RETURN ON ASSETS	FISCAL YEAR END	LOCATION
			CORP 1988	AS % OF TOT REV				
97,400	2.2	130.0†	200.0	1.58	1,315.0	5.2	Dec.	N.Y.
31,700	36.6	66.4†	122.0	5.80	69.6	3.4	June	Fla.
2,985	86.9	142.2	37.7	8.88	62.1	18.5	May	Calif.
9,876	14.0	87.6†	NA	NA	25.7	24.0	Feb.	Calif.
3,860	(10.2)	98.1	37.5	9.90	29.4	10.3	Dec.	Pa.
3,600	0	101.3	24.3	6.67	(11.3)	NA	Mar.	Calif.
4,560	(6.5)	98.8†	18.4	4.08	35.8	7.9	Dec.	Ohio
3,800	(1.3)	119.1†	27.2	6.01	(84.8)	NA	Dec.	Calif.
3,120	30.8	113.2	28.4	8.04	(19.4)	NA	Dec.	Calif.
145,300	16.8	117.2†	1,147.0	6.73	1,397.0	6.1	Dec.	N.Y.
3,450	NA	99.1	29.4	8.60	NA	NA	June	N.J.
3,200	28	105.9	23.6	6.96	11.0	3.8	Mar.	Calif.
2,743	(2.4)	121.5	10.9	3.27	7.2	1.9	July	Texas
35,600	14.1	61.5†	NA	NA	NA	NA	Sept.	Ohio
1,562	40.1	198.4	30.7	9.91	29.3	13.3	May	Calif.
1,484	(47.0)	208.4	13.7	4.43	(19.9)	NA	Dec.	Calif.
1,250	4.2	245.0	39.8	12.95	47.8	14.9	Jan.	Calif.
1,725	39.1	177.9	22.4	7.30	34.6	15.1	Oct.	Utah
1,700	41.7	176.9	33.8	11.24	33.5	11.9	Dec.	Ore.
1,800	38.5	165.9	16.5	5.53	11.7	7.1	July	Calif.
15,690	(7.0)	91.2†	205.3	14.35	(8.6)	NA	May	Ore.
2,000	8.1	144.2	19.8	6.87	31.7	12.7	Apr.	Conn.
NA	NA	NA	NA	NA	NA	NA	Dec.	Ohio
153,000	12.4	110.8†	751.0	4.43	614.0	4.9	Dec.	Wash.
3,600	0	80.9†	7.5	2.57	5.3	2.4	Dec.	Va.
48,000	(4.0)	102.6†	352.6	7.16	476.2	8.5	Dec.	N.Y.
1,711	39.8	155.1	30.6	11.53	29.3	14.7	Dec.	Mass.
3,100	8.7	97.5†	14.6	4.83	12.5	4.8	June	Mass.
2,673	(6.5)	97.8	7.6	2.91	(14.8)	NA	Oct.	Texas
1,200	NA	214.8	7.1	2.75	14.4	8.6	Jan.	Texas
20,800	8.3	138.2†	318.3	11.07	452.9	12.8	Dec.	Calif.
4,976	(12.8)	121.7†	12.8	2.11	22.1	5.6	Sept.	Ohio
2,369	(12.3)	105.5	58.9	23.56	(33.5)	NA	Dec.	Ga.
2,000	29.4	120.0	3.8	1.58	NA	NA	Nov.	Pa.
33,000	10.0	55.8†	NA	NA	NA	NA	Aug.	N.Y.
38,500	9.7	57.1†	NA	NA	NA	NA	June	N.Y.
1,497	14.5	151.3	27.2	12.01	39.2	16.0	June	Ga.
3,800	18.7	57.6	0.7	0.32	6.4	5.7	Dec.	N.Y.
3,011	16.8	72.0	36.3	16.74	20.5	NA	Dec.	S.C.
2,700	17.4	79.1	11.8	5.53	7.4	7.2	Dec.	Va.
2,523	3.9	83.8	47.1	22.27	(47.0)	NA	Apr.	Mass.
1,833	(0.9)	112.7	18.0	8.72	14.6	7.9	June	Calif.
653	(8.0)	312.3	0.0	0.00	(16.6)	NA	Apr.	N.J.
2,399	(8.5)	84.7	22.8	11.22	(11.3)	NA	Sept.	Conn.
69,000	15.0	61.8†	0.0	0.00	499.0	9.9	Dec.	N.Y.
3,900	11.4	50.6	1.4	0.71	18.1	8.5	May	Ga.
2,500	1.9	78.8	12.6	6.40	17.8	16.7	May	Ark.
1,437	11.3	131.6	7.0	3.70	(19.4)	NA	Apr.	Ill.
1,810	2.1	103.5	15.6	8.32	12.5	12.4	Dec.	Ga.
1,130	86.2	158.1	NA	NA	NA	NA	Dec.	Calif.

*For companies with more than 95% of revenues from IS

†Based on total corporate revenues

The 50 Leading Non-U.S. IS Companies

1988 NON-US RANK	1988 WORLD RANK	1987 WORLD RANK	COMPANY	1988 IS REVENUE	1987 IS REVENUE	IS REV % CHANGE	1988 TOTAL REVENUE	IS AS % OF TOTAL
1	3	4	Fujitsu	10,999.1	8,740.0	25.8	16,905.5	65.1
2	4	5	NEC	10,475.7	8,230.5	27.3	22,895.1	45.8
3	6	6	Hitachi	8,247.6	6,273.7	31.5	46,885.1	17.6
4	8	7	Siemens	5,951.0	5,703.0	4.3	33,812.1	17.6
5	9	11	Olivetti	5,427.9	4,637.2	17.0	6,445.5	84.2
6	11	10	Groupe Bull	5,296.7	4,964.8	6.7	5,296.7	100.0
7	13	12	Toshiba	4,226.6	3,441.4	22.8	28,759.0	14.7
8	14	17	Matsushita	3,441.0	2,628.5	30.9	40,721.9	8.4
9	15	20	Canon	3,391.6	2,371.0	43.0	8,631.4	39.3
10	18	16	Nixdorf	3,044.9	2,821.5	7.9	3,044.9	100.0
11	19	18	NV Philips	2,794.6	2,601.6	7.4	28,365.7	9.9
12	22	21	STC	2,425.1	2,123.9	14.2	4,193.6	57.8
13	23	45	Memorex Telex	2,078.5	1,041.1	99.6	2,241.8	92.7
14	25	32	Nihon Unisys	2,057.7	1,294.6	58.9	2,057.7	100.0
15	30	33	Ricoh	1,727.5	1,275.7	35.4	5,370.1	32.2
16	31	23	Alcatel	1,716.0	2,055.4	(16.5)	13,137.5	13.1
17	32	41	NTT	1,694.0	1,128.5	50.1	42,920.3	3.9
18	35	37	Seiko Epson	1,487.7	1,198.4	24.1	2,724.5	54.6
19	36	39	Oki	1,472.1	1,137.3	29.4	4,311.8	34.1
20	41	47	Atlantic Computers	1,341.6	1,028.4	30.5	1,350.5	99.3
21	44	44	Mitsubishi	1,270.7	1,047.7	21.3	18,518.9	6.9
22	46	35	Inspectorate International	1,230.3	1,225.0	0.4	1,688.3	72.9
23	47	49	Société Générale	1,222.6	970.1	26.0	5,214.2	23.4
24	50	83	Nokia	1,165.1	417.4	179.1	5,212.4	22.4
25	51	52	C. Itoh	1,075.9	829.2	29.7	118,622.2	0.9
26	53	64	Cap Gemini Sogeti	976.5	682.3	43.1	976.5	100.0
27	56	51	Northern Telecom	900.0	900.0	0.0	5,407.5	16.6
28	57	65	Econocom	897.0	674.3	33.0	897.0	100.0
29	59	59	Amstrad	841.8	730.2	15.3	1,108.7	75.9
30	62	69	Alps	785.2	632.5	24.1	2,970.5	26.4
31	63	62	Mannesmann Kienzle	779.0	686.0	13.6	940.2	82.9
32	69	80	CSK	660.0	428.7	53.9	1,040.9	63.4
33	73	75	Comparex	614.5	530.8	15.8	614.5	100.0
34	77	74	Racal Electronics	554.1	549.1	0.9	2,572.4	21.5
35	78	81	Finsiel	545.4	424.1	28.6	545.4	100.0
36	79	93	Sony	515.6	365.5	41.1	15,406.0	3.3
37	85	82	Norsk Data	450.2	422.6	6.5	450.2	100.0
38	92	102	Acer Group	379.4	294.0	29.0	529.1	71.7
39	94	146	Sema Group	375.1	197.2	90.2	474.9	79.0
40	95	106	SD-Scicon	366.4	287.0	27.7	394.3	92.9
41	101	125	Sligos	343.1	232.6	47.5	343.1	100.0
42	105	109	Samsung	330.1	276.8	19.3	4,580.0	7.2
43	106	117	Intec	326.0	253.8	28.4	326.0	100.0
44	114	135	Mitac	293.3	207.2	41.5	293.3	100.0
45	117	177	Nomura Computer Systems	278.0	150.8	84.3	695.1	40.0
46	122	150	Logica	269.9	194.6	38.7	269.9	100.0
47	125	127	GSI	262.8	230.5	14.0	262.8	100.0
48	127	108	Kyocera	258.5	281.6	(8.2)	2,584.9	10.0
49	133	119	Thorn EMI	238.4	246.1	(3.1)	5,434.2	4.4
50	134	137	Software AG	237.0	203.0	16.7	237.0	100.0

All currency figures are in millions. NA = not available.

NONDOLLAR CURRENCY					R&D			FISCAL
1988 IS	1987 IS	% CHANGE	COUNTRY	1988 EMPLS	CORP 1988	AS % OF TOT REV	NET INCOME	YEAR END
¥1,409,537.0	¥1,263,992.0	11.5	Japan	94,825	1,498.6	8.9	456.5	Mar.
¥1,342,462.0	¥1,190,314.0	12.8	Japan	105,486	2,008.6	8.8	573.8	Mar.
¥1,056,933.0	¥907,315.0	16.5	Japan	161,000	2,204.3	4.7	1,060.3	Mar.
DM10,450.0	DM10,250.0	2.0	W.Ger.	353,000	3,690.2	10.9	792.1	Sept.
L7,065,400.0	L6,014,300.0	17.5	Italy	57,560	307.3	4.8	345.7	Dec.
Fr31,547.0	Fr29,832.0	5.7	France	45,557	611.3	11.5	50.9	Dec.
¥541,641.0	¥497,700.0	8.8	Japan	129,000	1,841.6	6.4	600.5	Mar.
¥440,968.0	¥380,145.0	16.0	Japan	134,186	2285.8	5.6	1,471.0	Mar.
¥434,634.0	¥342,895.0	26.8	Japan	40,740	678.9	7.9	289.5	Dec.
DM5,346.8	DM5,071.0	5.4	W.Ger.	31,037	300.1	9.9	14.8	Dec.
G5,525.0	G5,270.0	4.8	Neth.	310,300	2,338.4	8.2	534.1	Dec.
£1,362.9	£1,299.0	4.9	U.K.	33,848	377.6	9.0	264.9	Dec.
G4,109.2	G2,108.9	94.9	Neth.	13,142	44.6	2.0	30.7	Dec.
¥263,700.0	¥187,227.0	40.8	Japan	7,616	NA	NA	27.5	Mar.
¥221,378.0	¥184,[illegible]90.0	20.0	Japan	33,000	336.8	6.3	121.2	Mar.
Fr1,450.0	Fr1,780.0	(18.5)	France	127,000	1,005.8	7.7	497.9	Dec.
¥217,081.0	¥163,201.0	33.0	Japan	279,983	1,322.4	3.1	1,322.3	Mar.
¥190,649.0	¥173,317.0	10.0	Japan	19,000	247.9	9.1	NA	Mar.
¥188,651.0	¥164,481.0	14.7	Japan	18,659	277.2	6.4	106.4	Mar.
£754.0	£629.0	19.9	U.K.	1,431	NA	NA	65.8	Dec.
¥162,838.0	¥151,519.0	7.5	Japan	75,795	1,011.4	5.5	307.0	Mar.
SFr1,800.0	SFr1,835.3	(1.9)	Switz.	7,698	NA	NA	90.2	Dec.
Fr7,282.0	Fr5,829.0	24.9	France	1,137	NA	NA	6.9	Dec.
Fmk4,877.0	Fmk1,835.0	165.8	Finland	44,600	249.6	4.8	259.7	Dec.
¥137,880.0	¥119,924.0	15.0	Japan	10,400	NA	NA	101.4	Mar.
Fr5,816.0	Fr4,100.0	41.9	France	12,000	48.9	5.0	67.5	Dec.
		0.0	Canada	50,136	710.6	13.1	165.6	Dec.
G1,773.4	G1,366.0	29.8	Neth.	1,600	NA	NA	NA	Dec.
£473.1	£446.6	5.9	U.K.	1,644	1.2	0.1	165.1	June
¥100,626.0	¥91,478.0	10.0	Japan	22,800	70.2	2.4	42.1	Mar.
DM1,368.0	DM1,233.0	10.9	W.Ger.	10,315	NA	NA	NA	Dec.
¥84,574.0	¥62,000.0	36.4	Japan	5,559	19.5	1.87	31.2	Sept.
DM1,079.0	DM954.0	13.1	W.Ger.	1,127	NA	NA	26.2	Dec.
¥311.4	¥335.8	(7.3)	U.K.	[illegible]000	18.5	7.0	279.5	Mar.
L710,000.0	L550,000.0	29.1	Italy	4,912	28.5	5.2	16.1	Dec.
¥66,074.0	¥52,859.0	25.0	Japan	57,000	1,368.6	8.9	540.5	Oct.
NKr2,934.0	NKr2,847.0	3.1	Norway	4,100	44.8	9.9	(41.6)	Dec.
TAD10,864.2	TAD9,336.3	16.4	Taiwan	5,072	26.5	5.0	27.5	Dec.
£210.8	£120.6	74.8	U.K.	6,400	17.8	3.7	13.0	Dec.
£205.9	£175.5	17.3	U.K.	4,456	NA	NA	14.6	Dec.
Fr2,043.3	Fr1,397.4	46.2	France	NA	NA	NA	NA	Dec.
W241,460.0	W227,690.0	6.0	Korea	39,354	366.4	8.00	148.0	Dec.
¥41,[illegible]8[illegible].0	¥36,702.0	13.8	Japan	2,350	7.4	2.27	12.6	Mar.
TAD8,400.0	TAD6,580.0	27.7	Taiwan	1,200	14.7	5.01	20.5	Dec.
¥35,632.0	¥21,815.6	63.3	Japan	2,300	NA	NA	NA	Sept.
£151.7	£119.0	27.5	U.K.	3,400	NA	NA	19.0	June
Fr1,565.0	Fr1,385.0	13.0	France	9,340	16.1	6.13	10.4	Dec.
¥33,125.0	¥40,728.8	(18.7)	Japan	12,307	84.3	3.26	196.6	Mar.
£134.0	£150.5	(11.0)	U.K.	64,000	154.8	2.85	266.9	Mar.
DM416.2	DM364.9	14.1	W.Ger.	2,700	NA	NA	NA	Dec.

THE DATAMATION 100

At the Top Of the IS Peak

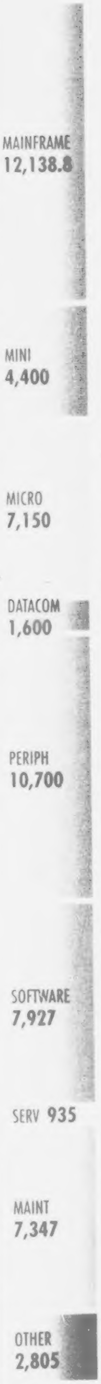
The inside stories of the 100 most successful IS vendors in the world, reported by DATAMATION's international team of correspondents.

Asia, Europe and North America are the three great sources of information systems innovation and products. This year's roster of the 100 most successful IS vendors lists 61 North American companies, 22 European companies and 17 Asian companies. They are profiled in the following pages* by 20 DATAMATION editors and contributors, based in nine countries around the world, who follow the companies year-round.

The story told in these 100 profiles is a rich one: the total IS revenues of these vendors comes to $243.1 billion in 1988, almost 17% higher than the IS revenues of 1987's top 100 vendors. Only five vendors had lower IS revenues in 1988 than in 1987. Still, in 1988, the story of IS was not without its perils. Revenue and profit growth were down from 1987, and some companies made it through the year by the skin of their teeth. Some, accustomed to high flying, found ceilings limited. Still others scored revenue growths that dazzled.

The revenues of these 100 vendors represent approximately 80% of the entire worldwide IS market. IS is a global business: almost all of these stellar vendors operate worldwide. But for many, "international" equals "multilocal"—the vendors operating independent business units close to their widely scattered customers. To help you locate the multiple revenue sources of these companies, many of the profiles contain charts that show just where in the world these vendors are earning their money. Detailed 1988 financial data on the companies, including comparisons with their 1987 performances, begins on page 22 for U.S.-based companies, on page 28 for non-U.S.-based companies. Other tables comparing some companies' performances in eight specific market sectors can be found in Technology Insights, beginning on page 149.

**To find profiles of individual companies, please see the index on page 148.*



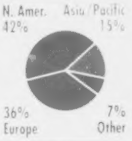
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

A Full Dance Card For Big Blue

Partnering with its rivals, IBM looks to regain momentum. Can the monster do the Niche Step?

1
Total DP Revenues
55,002.8

INTERNATIONAL BUSINESS MACHINES CORP.
Old Orchard Road
Armonk, NY 10504
(914)-765-1900



If 1987 was its "year of the customer," last year could be tagged as International Business Machines Corp.'s "year of the partner." IBM offered its proprietary chips to archrival Digital, joining the minimaker in an anti-AT&T, multicompany UNIX consortium. The same chip technology was also offered to IBM's mainframe rivals. Siemens AG, IBM's biggest competitor in Europe, was another unlikely ally. The two got cozy in a joint marketing venture, and IBM's new German friend made a deal to buy the development and manufacturing arms of IBM's telecom company, ROLM. Another old nemesis was also offered the hand of friendship—former Apple chief, Steve Jobs. IBM is paying him millions to use NeXT Computer Inc.'s user-friendly interface.

Even the Japanese are receiving friendly overtures. A dozen or so joint ventures are under way with the likes of Nippon Steel, Nissan and Sumitomo Electric Industrial, and Japanese customers can buy Big Blue mainframes with Japanese clone operating systems.

John Akers, IBM CEO, partner of partners

IBM's web of alliances is now so complex that nobody can keep track. Its worldwide network of value-added resellers (VARS) and marketing partners is thousands strong and growing. Then there's the minority stake, typically 10 to 20%, which IBM is now fond of taking in entrepreneurial ventures that augment its own products. Metaphor Computer Systems Inc., a maker of data retrieval software, is an example, as is IBM's equity in the supercomputer venture Supercomputer Systems Inc., formed by Cray Research Inc. breakaway Steve Chen.

The partner IBM most wants, of course, is the customer. IBM's uniqueness had been its ability to support the whole account: products, hand-holding, industry know-how—IBM had it all. But in recent years such expertise has been obscured by a calcified bureaucracy and lackluster products. Then in 1988 a major turning point came about both in IBM's relations with customers and in its products.

The giant's U.S. operation splintered into five lines of business (six, if you count its revamped marketing organization), each with decentralized decision-making and product responsibility. IBM regained lost ground in both the mainframe and minicomputer arenas. Its 103MIPS-plus 3090S model returned the company to the top of the big iron league. But it was the AS/400—"one of the most successful products in IBM's modern history," to quote IBM chairman John Akers—that really captivated customers. The machine's bundled blend of data base, applications and friendliness is an embodiment of IBM's whole solution strategy. Over 30,000 of them were shipped between July 1988 and January 1989, constituting a $3 billion-plus business built from scratch in just six months.

The newly elected head of IBM's Entry Business Systems, Jim Cannavino, said in March that IBM is now "winning the battle for customer mind share" at the PC end. He says customers and software writers seem readier than ever to commit to IBM's OS/2 operating system and MicroChannel bus; they are reluctant to wait for an alternative from the clone consortium, the Extended Industry Standard Architecture, the so-called "Boys on the Bus."

IBM's U.S. business shrank in 1986 and 1987 and was flat last year. One big reason: the sales force was geared to selling boxes at a time when, as IBM marketing head George Conrades puts it, the IS budget is "over 50% human resources." That all changed this January. Now, sales force compensation is determined by revenue per account, as opposed to quotas of boxes sold.

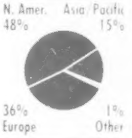
Whether through partnerships, corrections of past sins or the elimination of marginal operations, 1988 was a turning point for IBM. Earnings grew a healthy 10.4% to $5.81 billion and sales were up a respectable 8% to just shy of $60 billion. ▭

2

Total DP Revenues 12,284.7

DIGITAL EQUIPMENT CORP.

146 Main Street
Maynard, MA 01754
(508)-897-5111



MINI	3,735.6
MICRO	50
DATACOM	225
PERIPH	3,166.2
SOFTWARE	794.6
SERV	216
MAINT	3,882.3
OTHER	215

There's a side to Digital Equipment Corp. that hadn't been evident since the late 1970s. The company isn't the surging, confident Digital of recent years; it's a more defensive company whose demeanor recalls behavior of more than a decade ago.

Before the VAX computer era began almost a dozen years ago, a series of smaller rivals challenged Digital and its then 16-bit PDP-11 mainstay with much faster and more powerful, 32-bit computers. These upstart computer makers, such as Prime Computer Inc., grew quickly at the expense of Digital, whose first VAX computer appeared several years later. While the growth of Digital and its 32-bit VAX family has overshadowed its competitors, there was plenty last year to echo the pre-VAX days.

In 1988, Digital was nettled by a group of younger and faster moving companies. These upstarts, none of which was even formed until the 1980s, include workstation and software companies COMPAQ Computer Corp., Novell Inc. and Sun Microsystems Inc. In 1988, Digital found itself on the defensive, even as it marshaled new attacks on IBM's heartland. Although still able to enter the transaction-processing and systems integration services markets, it was as much occupied with securing established bases in engineering and work group systems as it was with landing fresh blows against the Big Blue empire.

These upstarts, and the market forces they represent, forced Digital to revise its single architecture plan. Through alliances with Mips Computer Systems Inc. and Tandy Corp., Digital prepared a series of UNIX and MS/DOS workstations to challenge Sun and Compaq. A low-cost PC LAN took aim at Novell.

Still, Digital's blurring market focus did not lead it to neglect its commercial-systems tack, and it unveiled new high-end VAX computers and transaction-processing software to pressure IBM's data center stronghold. The flagship VAX was upgraded and expanded at every turn. The individual high-end, midrange and low-end computers once offered by the company have grown into separate families.

Despite these moves, weaker-than-expected sales of the VAX 8800 series reversed the company's recent record of ever-increasing earnings. Profits fell nearly 6% to $1.21 billion despite an 18% increase in sales. Non-U.S. sales exceeded the U.S. results for the first time, accounting for 52.4% of the company's $12.27 billion annual revenues.

If competition in 1988 suggested the late 1970s, there was still another reason for déjà vu: Digital disclosed plans for a new computer architecture. Called Application Integration Architecture, this software environment carries the VAX to the world of heterogeneous computing and industry standards. More important, it introduces Digital to the desktop-focused, and typically UNIX world, of its smaller competitors.

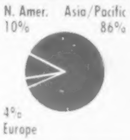
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

3

Total DP Revenues 10,999.1

FUJITSU LTD.

Marunouchi Center Building
6-1 Marunouchi 1-chome
Chiyoda-ku, Tokyo 100, Japan
(81-3)-216-3211



MAINFRAME	4,184.9
MINI	991.2
MICRO	595.3
DATACOM	816.7
PERIPH	2,728.5
SOFTWARE	676.1
MAINT	1,006.4

Fujitsu Ltd. passed two information systems milestones last year. One—bragging rights to the world's fastest computer—proved short-lived, but two marketing agreements portend major changes in the company's systems business. Having previously supplied semiconductor and central processor development expertise to Sun Microsystems Inc. and Amdahl Corp., respectively, Fujitsu turned to the pair to supply new systems for its domestic market.

In August, Fujitsu entered the fast-growing Japanese market for engineering workstations by licensing Sun's RISC-based Scalable Processor Architecture (SPARC). Less than two months later, Fujitsu introduced the Amdahl 5990-1400 and 5990-700 in Japan. The pair, which compete against IBM's ES/3090 mainframes, are Fujitsu's first fully IBM software-compatible mainframes.

The SPARC-based Fujitsu S family workstations mark the company's first entry into the UNIX engineering workstation business, which in Japan grew an estimated 250% in unit shipments during 1988. Analysts estimate that Japanese sales of workstations rose to 70,000 units from 20,000 the year before.

The agreements reflect new efforts to revitalize Fujitsu's mainframe-oriented IS business. IS revenues for 1988 grew 11.5% to ¥1.4 trillion ($11 billion), slower than the growth rate of the prior two years. Moreover, its IS business failed to match the company's overall revenue growth rate.

In December, Fujitsu started selling eight models of its newly developed FACOM VP 2000 series supercomputer. One model, the VP2600, is capable of 4 billion floating point operations per second (FLOPS) vector-processing speeds. But its claim to the title of the world's fastest supercomputer was short-lived, as NEC soon introduced a faster machine.

Among its international ventures, Fujitsu consolidated three of its U.S. voice and data communications operations into a single operating unit, Business Communications Systems Inc. The Anaheim, Calif., operation brings together development, manufacturing, sales and service organizations into one unit. As a part of the consolidation, Fujitsu acquired GTE Corp.'s 20% interest in Fujitsu GTE Business Systems.

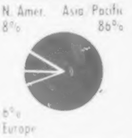
While relying on partners for an infusion of systems, Fujitsu's commitment to research and development was displayed at Fujitsu Technology '88, a show held to mark the opening of a new technology center. On display were neurocomputer-based robots and AI systems; a coherent light wave communication system capable of multiplexing thousands of image or millions of voice signals; a 512 megabits per second photonic switching system; and advances in component technology, including a 4-bit Josephson Junction-based microprocessor and a biosensor that incorporates biological material.

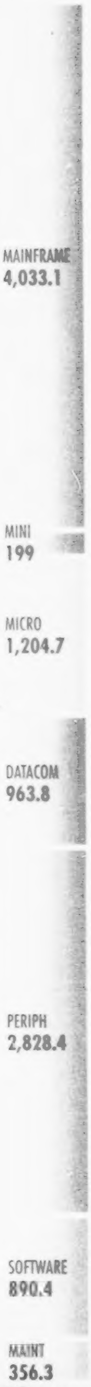
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

4
Total DP Revenues
10,475.7

NEC CORP.

33-1 Shiba 5-chome
Minato-ku, Tokyo 108, Japan
(81-3)-454-1111





REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

In 1988, NEC Corp. introduced new computers in all of its product lines, but the biggest potential money-maker is its new SX-3 line of supercomputers. Introduced on April 10, 1989, the SX-3s are expected to be up to eight times faster than the most powerful U.S.-made supercomputers.

The computers use 20,000-gate large-scale integration (LSI) chips with 70-picosecond switching speeds to perform as many as 2 billion operations per second. They are also available in multiprocessor versions that NEC did not previously manufacture. The speeds of single-processor SX-3 machines range from 1.37 to 5.5 billion floating point operations per second and from 5.5 to 22GFLOPS for multiprocessor models. NEC has developed a new Super-UX operating system based on AT&T's version of UNIX as well as on the SXOS operating system that has been used on NEC supercomputers up until now.

While some observers question whether the SX line's technological edge will cause many loyal users of Cray Research Inc.'s supercomputers to jump ship, the SX's arrival has created a furor of anxiety in Washington over the issue of keeping the United States in the lead in that market. Cray currently owns 66% of the worldwide market for supercomputers.

NEC is still loyal to its C&C strategy, formulated in 1977, by which it is committed to integrating computers and communications, to developing new digital communications and to distributed data-processing platforms.

IS sales in the first half of 1988 were slow but picked up by the end of the year to reach ¥1.3 trillion ($10.5 billion), 12.8% over 1987's levels. IS revenues constituted 46% of total sales. Net income was up 144.5% to ¥73.5 billion ($573.8 million).

In software, NEC began delivering its Distributed Information Processing Systems Architecture, announced in December 1987. The software provides an environment in which data and applications software can be shared easily among all of NEC's hardware products, from PCs to supercomputers.

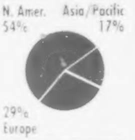
Strong growth in hardware sales in 1988 was exemplified by increased demand for the small-scale System 3300 mainframe and for 32-bit PCs. Compact size and integrated networking capabilities apparently were the reasons the System 3300, unveiled in July 1987, got a favorable reception in 1988. Stronger domestic demand for 32-bit PCs contributed substantially to the company's growth; NEC accounts for almost half of that market in Japan.

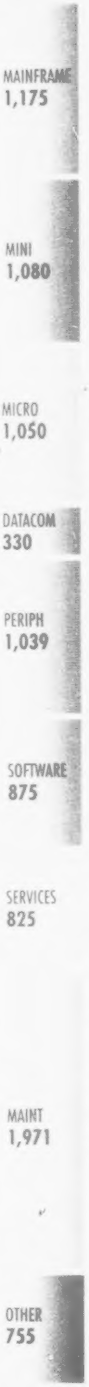
Another product segment receiving rapidly increasing attention from NEC is the office, or small-business, computer. These computers, which NEC calls SBCs, feature high processing speeds, are easy to use and can be networked in a typical office environment. NEC introduced in 1988 the System 3050 and 3100 series of SBCs.

5
Total DP Revenues
9,100

UNISYS CORP.

Township Lane and
Union Meeting Roads
Blue Bell, PA 19424
(215)-542-4011





REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

After reporting higher-than-expected first-quarter earnings—up 35.5% over the previous year—Unisys Corp. saw both its revenue and earnings gains shrink through the rest of the year. By the fourth quarter, Unisys could muster only a 2.7% revenue increase, and earnings were essentially flat compared with the previous year's fourth quarter. Those results kept Unisys' total revenue increase for the full year to less than 2% and held its earnings increase to 17.7% since 1987. For the year, Unisys' revenue growth from IS products was only slightly better at 2.2%. Unisys' 1988 IS-related revenue was $9.1 million. While Unisys' revenues from international operations grew 6.6% in 1988, domestic revenues dropped nearly 2%.

The late 1988 downturn at Unisys was attributed to a slowdown in U.S. demand for large systems, as well as a troublesome product transition and the costs engendered by a corporate reorganization.

The long-awaited product transition in the company's important 1100 mainframe product line did not add to 1988 revenues. On the contrary, while two key replacements for the aging 1100 line were announced in March of 1988, Unisys did not ship them in any volume until early 1989. The midrange 2200/400 and the high-end 2200/600 use advanced complementary metal-oxide semiconductor (CMOS) technology to achieve improved performance, along with reductions in power consumption and size. As expected, there was plenty of pent-up demand for the new models, but orders for older products dried up and Unisys revenue suffered.

As a result of the revenue atrophy, Unisys announced early in 1989 that it would trim its work force sooner than expected, eliminating 2,500 jobs to bring the number of employees down to 90,000.

Unisys continued to invest in its thriving commercial UNIX- and network-based businesses, up by about 15% in revenues in 1988. Unisys estimates its UNIX and desktop computer business has accounted for about $2 billion in annual revenues, including hardware, software and services. Unisys increased its research and development spending in 1988 by 19% to $713 million, much of that increase going into UNIX and desktop systems.

Unisys bolstered its position as a vendor of networked UNIX desktop systems by acquiring Santa Clara, Calif.-based Convergent Technologies Inc. for $350 million. Prior to the deal, Unisys had purchased workstation and UNIX products from outside OEM vendors such as Convergent Technologies Inc. and NCR Corp. Unisys continues to resell some UNIX and desktop products made by other companies.

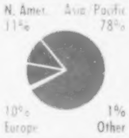
Unisys has said it expects continued revenue weakness in the first half of 1989, despite solid international business. But it expects volume shipment of new products such as the 2200/400 and 2200/600 to bolster second-half revenues and earnings.

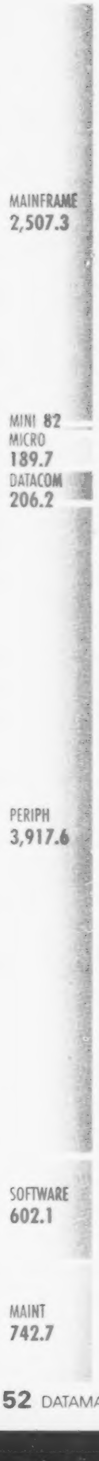
6

Total DP Revenues 8,247.6

HITACHI LTD.

6 Kanda-Surugadai 4-chome
Chiyoda-ku, Tokyo 101, Japan
(81-3)-258-1111





Last year was eventful, to say the least, for Hitachi's Ltd.'s relationship with U.S. computer vendors.

Motorola Inc. and Hitachi have jockeyed back and forth in U.S. courts, variously dismissing, refiling and moving their respective patent infringement claims after Motorola alleged that Hitachi had infringed on its microcontroller patents. Ironically, the two companies have a long history of technical exchanges and cross-licenses dating from the mid-1970s and had made agreements to act as second sources for some of each other's products, including Motorola's 6800 and 68000 microprocessors and Hitachi's 6301 CMOS microcontroller and 6845 CRT controller. Hitachi has asserted that no infringement exists and that the H8 unit in question is a licensed Motorola patent.

Hitachi and Electronic Data Systems Corp. also began negotiations last year to jointly purchase National Advanced Systems from National Semiconductor Corp. for $400 million. When these negotiations are completed this year, the acquisition of Santa Clara, Calif.-based NAS will give Hitachi an 80% stake in a plug-compatible manufacturer OEM partner in the United States.

Computers, semiconductors and other computer equipment were the leading profit makers for Hitachi last year, bringing 1988 total sales up 25.6% to ¥6 trillion ($46.9 billion). IS sales were up 16.5% to ¥1.1 trillion ($8.2 billion). Net income was up 27.9% to ¥135.9 billion ($1.1 billion).

In response to changing domestic market requirements, Hitachi released several new products last year. The M-620, M-630 and M-640 are compact, high-performance low- to midrange general purpose computers. The M-620 is seen as a departmental computer, filling the gap between end users' workstations and central mainframes.

For smaller scale distributed systems, Hitachi introduced the E-7700 series of superminicomputers. In the workstation sector, the firm is marketing models with 32-bit processors and enhanced graphics capabilities. In January, the company announced a prototype of the 32-bit GMicro, which it has been developing jointly with Fujitsu Ltd. and Mitsubishi Electric Corp. Hitachi has also designed a laptop PC with an eight-color thin film transistor liquid crystal display. The new laptop, the HL400C, is based on a 12 megahertz Intel Corp. 80286 microprocessor. Hitachi's 1988 microcomputer sales were up 27.9% to ¥24.3 billion ($189.7 million).

In software, the company announced Hitachi Application Architecture (HAA)—similar to IBM's Systems Application Architecture (SAA)—which will enable Hitachi systems of all sizes to use the same software. In addition, the company brought out Software Engineering Workbench (SEWB), a set of applications for improving software development.

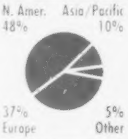
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

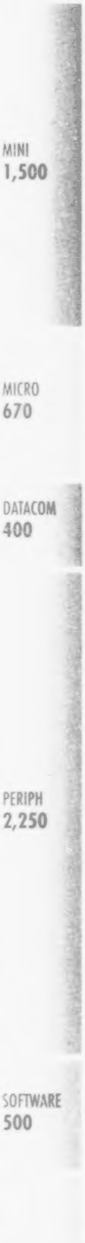
7

Total DP Revenues 6,300

HEWLETT-PACKARD CO.

3000 Hanover Street
Palo Alto, CA 94304
(415)-857-1501





As it enters its 50th year of business in 1989, Hewlett-Packard Co. can boast about good financials and gloat that reduced instruction set computing (RISC) is finally becoming a household word. Now, HP is beginning to enjoy the fruits of Spectrum, its massive RISC-based computer architecture project. However, chief executive officer John Young reflects, "We're still kind of feathering down from the large investments we made in our Spectrum program and networking projects."

Until September, it looked as if HP might land with a thud. That's when HP finally got out what's considered the first legitimate working release of its MPE-XL operating system, without which users were hesitant to commit to commercial HP 3000 Spectrum minicomputers. Now orders are picking up. But, orders for HP 9000 Precision Architecture machines running UNIX outshone expectations all year long. Recognizing a good thing when it saw it, in May HP became a cofounder of the UNIX-oriented Open Software Foundation, and HP executive vice president John Doyle is currently serving as OSF chair.

HP's real shining stars were found outside its traditional mini business. Along with workstations, personal computer products and peripherals did well. In fact, while orders for all HP information systems increased by 26%, peripherals did even better, growing by nearly 30%. The year also saw the shipment of the one millionth HP LaserJet printer.

For the fiscal year, ended October 31, net revenue and income both climbed at a faster pace than they did in 1987. Revenue jumped 22% to $9.8 billion while earnings increased 27% to $816 million. Orders met HP's goal, going over the $10 billion mark. International orders grew 29%, accounting for about 52% of HP's total business.

No year is complete at HP without a corporate reorganization. Chief operating officer Dean Morton no longer manages all the business sectors; some of the load has been transferred to chief executive Young. And in October, the computer business was realigned into the Computer Products Sector—oriented toward PCs and workstations primarily sold through indirect channels—and the Networked Systems Sector—for multiuser systems or those products sold directly.

External organizational moves included a networking alliance with Northern Telecom Ltd., the purchase of a 10% interest in Octel Communications Corp. and, in early 1989, the decision to purchase 5% of 3Com Corp. HP also announced that it will join the growing ranks of computer companies willing to service third-party equipment.

After two years of no growth in employment, HP added 5,000 new workers in 1988, reaching a total of 87,000 employees worldwide. "By and large, we're looking forward to another pretty strong year for Hewlett-Packard," chief executive Young says.

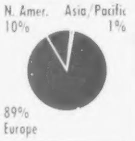
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

Focusing on narrow niches such as CAD/CAM is a marketing strategy evident at many of the Top 100 companies. Few have enough resources to compete on a broad scale.

8
Total DP Revenues
5,951

SIEMENS AG

Wittelsbacherplatz 2 D-8000
Munich 1, West Germany
(49-89)-2340



MAINFRAME 683.4
MINI 284.7
MICRO 313.2
DATACOM 1,338.3
PERIPH 1,566.1
SOFTWARE 626.4
SERV 170.8
MAINT 968.1

West Germany's Siemens AG, Europe's largest indigenous IS supplier, suffered plummeting IS revenue growth last year—down to only 2% in 1988, on revenues of DM10.45 billion ($5.95 billion at DM1.76 = $1), compared with a healthy 7.7% surge the previous year.

This slowdown, combined with a softening of the European office systems business and the prospect of a single European market after 1992, galvanized the traditionally cautious company into action. It began its first major management shake-up since 1969, launched an aggressive expansion campaign to improve its international operations and established a long-overdue worldwide support program for its multinational IS users.

On the product side, there was little movement in sales of IS systems, despite the launch of new SINIX-based workstations and laser printers. However, Siemens' personal computer business improved markedly—up by around 50%. Furthermore, and the marketing focus on the Hicom PBX—1988 was designated the Year of Hicom by Siemens—seems to have paid off. Around 750 of the systems were sold last year.

Acquisitions, mergers and joint ventures are high on the list for the new Siemens. President and chief executive officer Karlheinz Kaske states that he "will consider any opportunities that present themselves, so long as they fit into our strategic concept."

As part of this expansion plan, Siemens joined forces with the London-based electronics giant General Electric Co. (GEC) last November in a hostile bid to acquire British communications specialist The Plessey Co. PLC. The deal is still dragging on, but if successful it will give Siemens part ownership of the Coventry, U.K.-based GEC Plessey Telecommunications Ltd. subsidiary and will significantly improve the company's access to the British domestic defense electronics market.

Last December, Siemens surprised the industry again by announcing a joint venture with IBM in the PBX sector built around IBM's ROLM Corp. subsidiary, which IBM acquired in 1985. Siemens picked up the development and manufacturing side of ROLM, part ownership of the U.S. marketing arm and a deal to supply its Hicom digital switch for IBM to sell in Europe.

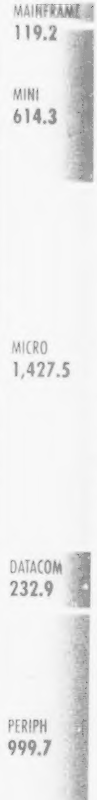
That deal followed the company's other major U.S. venture in 1988 with Intel Corp. to create a new company, BiiN, in Hillsboro, Ore. That company will develop mission critical systems in both the United States and West Germany.

With these deals under way, Siemens also began shuffling thousands of employees into a new corporate structure that will eventually comprise between 15 and 20 flexible and independent business groups. Meanwhile, the company's work force was slashed by 6,000 at home in West Germany.

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

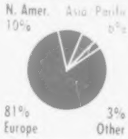
Restructuring For the New Realities

Olivetti shakes itself up to restore profit margins and prepare for 1992.



9
Total DP Revenues
5,427.9

ING. C. OLIVETTI & CO. SPA
Via G. Jervis, 77 10015
Ivrea, Italy
(39-125)-525



Squeezed by tighter margins, hit by profit shortfalls and caught by markets that are becoming ever more product specific, Italy's Ing. C. Olivetti & Co. SpA announced in late 1988 that it was embarking on a massive restructuring program. Much of this reshuffling was due to Vittorio Cassoni, who was called back in May from the United States, where he had been on loan from Olivetti, heading up AT&T's data systems division since November 1986. In the new structure, Cassoni became comanaging director, along with chairman Carlo de Benedetti.

Vittorio Cassoni, Olivetti's remaker.

To compete with Pacific Basin suppliers and Japan Inc., Olivetti formed a new Olivetti Office division for mass-consumption products such as typewriters, text processors, facsimile and copying machines.

The Olivetti Systems and Networks group competes with Digital, IBM, NCR and others in the area of application solutions based on distributed data processing. The group's product line comprises a wide range of PCs and workstation systems, minis, networks and Hitachi Ltd. IBM-compatible mainframes for the Italian and Spanish markets.

Olivetti Information Services was formed for systems integration and services and competes with companies such as Electronic Data Systems Corp. and France's Cap Gemini Sogeti.

What motivated this regrouping was a worsening drop in profits during the year, which left annual income down 11.5% to L356 billion ($273.4 million). Company revenues were up 14% to L8,407 billion ($6.5 billion), and IS revenues grew 17% to L7,065 billion ($5,4 billion). Profits had already dropped by 30% during the previous year. Nevertheless, all product areas showed growth. Olivetti is having trouble building up its minicomputer sales, despite a wide range of products, including its own LSX line, AT&T's 3B systems and Stratus Computer Inc.'s fault-tolerant systems. Minicomputer sales were only up 2% to L799.6 billion (or $614 million).

Through 1988, Olivetti continued to push efforts to integrate its products with other manufacturers' systems, part of the company's Open Systems Architecture (OSA). Olivetti and Digital agreed to exchange technology to allow integration of Olivetti PCs into Digital networks, using Digital's Network Applications Support. The Digital link has since become considerably stronger, following a deal in April of this year for Olivetti to supply Digital with PCs for European distribution.

Olivetti Systems and Networks presented a new series of PCs, called P500 and P800. They are based on the Intel 386SX microprocessor and use IBM's MicroChannel Architecture. Olivetti and U.S.-based Stratus agreed to develop a fault-tolerant version of UNIX for Stratus' fault-tolerant computers, making them compatible with Olivetti systems.

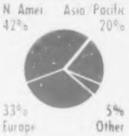
Olivetti has a long history of investment in smaller technology companies around the world. Its portfolio currently contains around 240 companies including Acorn Computers in Britain, Bunker Ramo in the United States, Scandinavian Scanvest-Ring and Triumph Adler in West Germany. Cassoni's main job now is to pull together these disparate elements and create coordinated product lines across the organization. The new restructuring and the concentration on OSA are going to help make that job easier. Standing in Cassoni's way is a fast-changing European PC market, AT&T's increasing distance from the company, despite its 24% stake, and its recent decision to look elsewhere for PCs for the United States this year.

Then there's 1992 on the way. As Cassoni puts it, there will have to be more than just an internal restructuring of European companies in the advance toward a unified European market. There will have to be a restructuring of the whole industry. "There are too many of us," he says.

10
Total DP Revenues
5,324

NCR CORP.

1700 South Patterson Boulevard
Dayton, OH 45479
(513)-445-5000



MAINFRAME	218.3
MINI	454.4
MICRO	368.3
DATACOM	173
PERIPH	1,872
SOFTWARE	140
SERVICES	419.4
MAINT	1,678.6

Bob Neese, a 20-year NCR Corp. customer and executive vice president of operations at Cape Cod Bank & Trust Co. in south Falmouth, Mass., has one burning question: When will NCR produce a top-of-the-line system he actually wants to buy? Like many other IS chiefs, he believes that NCR's 9800 flagship mainframe is woefully underpowered and bereft of really useful software. "We're just lying back and waiting for them to iron out the kinks," he says, echoing the thoughts of hundreds of other NCR computer customers who paused to reflect in 1988 and didn't buy.

Although there was still momentum last year—revenues inched up 6.2% to just under $6 billion, and profits rose 4.7% to $439.3 million—NCR's order book took a big hit. As a result, the company's 1989 outlook is gloomy.

NCR's chief executive officer, Charles Exley, has built up a number of successful side businesses: ATMs (an area in which NCR is a leader), UNIX-based supermicros, communications processors and PCs. But without the 9800, there would be no center. NCR's on-line transaction-processing mainframes are the way the company differentiates itself and the way it adds value with proprietary products in a world it helped usher in: the world of open systems, of micros and of standard software. Without the mainframes, NCR would be just another value-added reseller of standard technology. Such a possibility has caused growing numbers of large customers to defect to IBM and Tandem Computers Inc. in recent years.

To stop the rot, Exley has shifted his research and development effort into high gear. Spending grew nearly 17% in 1988 (reaching the industry average of 7% of revenue) and will climb another 15% this year. Two new 9800 processors, one for applications and one for data storage, were unveiled in December. Respectively, they offer 60% and 30% greater performance at no increase in the total cost of ownership, NCR claims. To increase the 9800's attractiveness as a host, the company is now offering the first software to integrate it with its line of Tower UNIX processors and a variety of local and wide area network schemes. Since new applications are scarce on the mainframe, a new UNIX-based software development platform, the NCR Union, has been added.

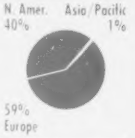
The Tower family, a nearly $500 million business, was started in 1982 and is now under mounting pressure from Digital, Hewlett-Packard Co. and IBM, among others. These competitors offer their UNIX systems as part of a total integrated architecture: one-stop shopping. So, NCR must do the same. NCR hopes to consolidate its 9800 and its new 10000 series multiuser minis around one RISC-based (reduced instruction set computer) platform, say insiders of another R&D program that is expected to bear its first fruit in 1990.

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

11
Total DP Revenues
5,296.7

GROUPE BULL

121 Avenue de Malakoff
75116 Paris, France
(33-1)-45 02 90 90



MAINFRAME	901
MINI	477
MICRO	318
PERIPH	1,325
SOFTWARE	583
SERVICES	318
MAINT	1,374.7

By the end of last year, France's Groupe Bull, in which the French government has a 92% holding, had established solid control of the global heritage of Honeywell Inc. The result: one of America's best-known pioneering computer companies is now owned by the people of France.

Bull increased its stake in its Honeywell Bull Inc. U.S. subsidiary from 42.5% to 65.1% in 1988—reducing Honeywell's stake to 19.9% and leaving NEC Corp.'s share unchanged at 15%. The U.S. company was renamed Bull HN Information Systems Inc.

Therefore Groupe Bull was able to announce consolidated worldwide IS revenues of FF31.5 billion ($5.3 billion) for 1988. France's share of those revenues amounted to no more than 39.9%, with North America contributing 18%, the rest of Europe chipping in 36.1%, and 6% coming from Asia and Africa.

However, the group's consolidated net earnings of FF303 million ($51 million) were generated solely by the French-based company, Bull SA, which operates in all European markets (apart from Britain and Italy), as well as in Africa, the Middle East, the Far East and South America. Bull HN in the United States did no more than break even. That was still an improvement. Although the U.S. operation reported a profit of $17 million in 1987, it was entirely due to exceptional gains of $34 million, so it actually had an operating loss of $17 million.

Bull improved its sales and earnings performance on both sides of the Atlantic in 1988, with average gross margins widening to 44.6% from 43% in 1987. The greatest setback for Bull in 1987 had been in its home turf, where sales actually fell. That situation was reversed in 1988, when French revenues advanced by 7%. At the same time, sales growth was even stronger elsewhere in Europe. In the United States, chief executive officer Roland Pampel says, Bull HN has completed "its overhaul phase" and is putting the emphasis on sales growth rather than on profitability over the next three years.

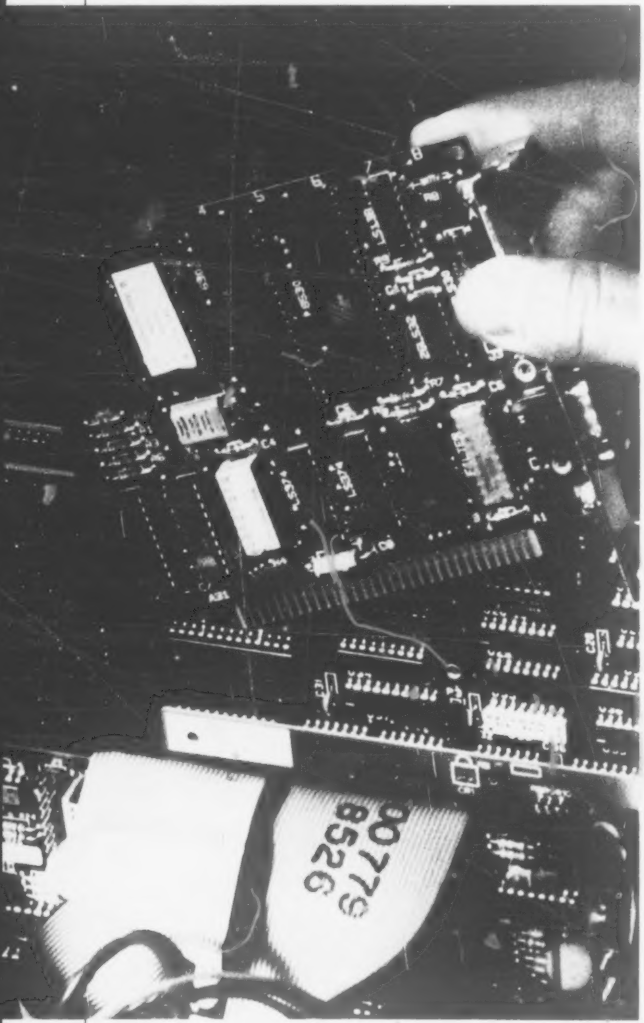
The outstanding new product launched by Bull in 1988 was undoubtedly its DPS 9000 business system, which runs on the GCOS 8 operating system.

Bull also announced the renewal of its DPS 4000 small business systems and enhancements to its popular DPS 7000 departmental systems during 1988. It grasped the open systems nettle with a new range of 10 UNIX-based systems, including the DPX 1000, 2000, 3000 and 5000, all developed in France. Moreover, early in 1989, Bull became the world's first vendor to be licensed to use the X/Open brand for its SPIX version of UNIX System V.3.

Lower down the processor scale, the company expanded its family of Questar workstations and introduced an OS/2 micro, the Micral 75. Sales of both product lines showed exceptional growth during the year.

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

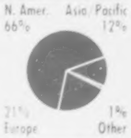
Proprietary systems drove up profits for some **companies**, such as Apple. **Others, however**, abandoned their **closed systems** in favor of **open platforms**.



12
Total DP Revenues
4,434.1

APPLE COMPUTER INC.

20525 Mariani Avenue
Cupertino, CA 95014
(408) 996-1010



MICRO
2,950

PERIPH
1,350

SOFTWARE
134.1

A huge jump in revenues and profits didn't mean a year without drama for Apple Computer Inc. A two-part corporate restructuring led to the departure of several key corporate executives, but Apple mitigated the effect of these desertions by hiring several former IBMers. Also making news were important corporate agreements. But banner headlines awaited in early 1989: Apple shocked the industry when it announced that earnings for the first quarter of the new year would fall due to miscalculations in pricing and purchasing.

The wounded earnings were especially startling because they followed a year of tremendous financials. For the calendar year, Apple sales amounted to more than $4.43 billion, an amazing 45.8% jump from the $3 billion reported the year earlier. Net income also leaped to $419.3 million, up nearly 50% over the $280.5 million earned in 1987. International sales continued to inch upward and accounted for 33% of revenues in 1988 compared with 28% in 1987.

Apple hurt itself when it overreacted to rising costs and purchased significant amounts of 1 megabyte DRAMs. In September, to offset these higher component costs, it raised some prices. That lead to an unanticipated change in the sales mix, which shifted to less profitable stripped down systems. In January 1989, Apple retreated, lowering prices and making certain budget cuts such as limiting hiring. Still, Apple chairman John Sculley says he still expects revenues to increase 30% or more in 1989.

Aiming at its next goal of a $10 billion year in revenues, targeted for 1993, Apple reorganized twice. In April, it split into three marketing/sales groups by breaking out Asia, Europe and the United States. In August, the company then split into four independent operating divisions: Apple Products, Apple USA, Apple Europe and Apple Pacific. The big loser in the shuffling was chief operating officer Del Yocam, who lost his title and was named head of Apple Pacific. Yocam announced his retirement.

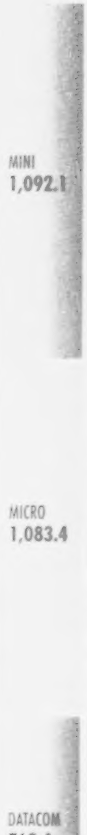
While the organizational moves were made to prepare Apple for the 1990s, unquestionably the star for some time to come will be the Macintosh computer. In September, Apple introduced the Macintosh IIx, the first Mac to use the 68030 chip and provide a 3½-inch floppy disk that can read and write to both MS-DOS and Apple II formats. This product was followed in January 1989 by the more compact Macintosh SE/30. What still hasn't appeared, though, is the much-delayed Macintosh laptop.

Apple continued to work on its networking alliance with Digital, announcing that Digital's field service staff would service Macs. The company also unveiled VAR relationships with Texas Instruments Inc. and Tandem Computers Inc. and continued its small streak of acquisitions by buying Network Innovations Corp. and Orion Network Systems Inc.

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

Big Yen for Small Computers

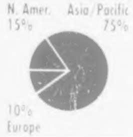
Toshiba overcomes trade sanctions and maintains its world laptop lead.



REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

13
Total DP Revenues 4,226.6

TOSHIBA CORP.
1-1 Shibauar 1-chome
Minato-ku, Tokyo 105, Japan
(81-3)-457-3273



Toshiba Corp. cracked a two-year-long slump, as corporate revenues last year rose 7% to ¥3.7 trillion ($28.8 billion). Brisk demand for semiconductors and portable computers contributed to the corporate revenue gains. Moreover, the company's strong earnings showed that Toshiba was more successful than many other Japanese electronics firms in coping with the strong yen. Net income outpaced the modest sales gains, rising a sharp 81%. IS revenues, which make up less than 15% of the company's total business, climbed 9% to ¥541.6 billion ($4.2 billion) on the continued strength of Toshiba's booming personal computer business.

Kunika Mizushima, Toshiba's IS chief

Toshiba dominates the laptop PC market, having captured an estimated 50% of the Japanese market, 45% of the European market and 25% of the U.S. market. This market dominance shows that the stigma of Toshiba's violation of the Coordinating Committee for Multilateral Export Controls' (COCOM's) trade sanctions is fading. The incident, in which sophisticated numerically controlled machine tools were shipped to the Soviet Union in violation of COCOM rules, injured the company's reputation and cut into its U.S. sales.

Toshiba has benefited from growing portable PC and laptop sales both in terms of revenues and increased international visibility. Revenues from the laptop and portable lines rose 30% last year, and some analysts estimate that growth will continue in 1989. The laptops helped boost sales of microcomputers. Revenues there climbed a robust 20% to ¥138.8 billion ($1.1 billion). Among other systems division operations, minicomputer sales rose in its domestic Japanese markets. Buoyed by strong international sales of printers, peripherals equipment sales showed a 13% increase, reaching ¥142.7 billion ($1.1 billion). Toshiba acknowledged that its results in telecommunications (a market in which it is a relatively new player) and in the highly competitive plain-paper copier market were below its other product lines.

Determined to expand its laptop and portable computer business even further, Toshiba introduced two portable computers in 1988 to the European and U.S. markets. The 32-bit T5200, the most powerful Toshiba portable computer to date, is based on Intel Corp.'s 20 megahertz iAPX 80386 microprocessor. Because the new T5200 is a portable rather than a laptop computer, it can't run on batteries and must be plugged into an electrical outlet. The computer supports local area network applications and is light enough to be transported between office locations, which positions the computer well for those office environments where flexibility and security are requirements. The battery-powered T1600 has a 12MHz Intel 80C286 microprocessor, a backlit liquid crystal display (LCD) screen and a lifetime battery. In addition to its domestic manufacturing sites, Toshiba builds laptops at an Irvine, Calif., facility and intends to begin production next April at a West German plant now under construction.

Recently, the company has tried to broaden its semiconductor operations in order to reduce its current reliance on memory components. Last year, it established a semiconductor joint venture with Motorola Inc. and, more recently, agreed to share its application specific integrated circuit (ASIC) design technology with Siemens AG of West Germany.

Among significant product efforts this year, the company disclosed that it is developing a 14-inch LCD, the largest of its kind, in conjunction with researchers at IBM Japan's Yamato Laboratory. Prototypes, developed over a two-year period, include monochrome and color versions.

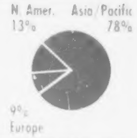
In addition Toshiba researchers independently developed an ISDN videophone capable of transmitting moving color images. The company also unveiled a 4 megabyte 3½-inch floppy disk drive. ▭

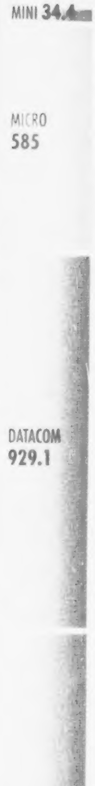
14

Total DP Revenues 3,441

MATSUSHITA ELECTRIC INDUSTRIAL CO. LTD.

1006 Kadoma, Osaka 571, Japan
(81-6)-908-1121





Matsushita Electric Industrial Co. Ltd.'s small IS operations continued to outpace the company's mainstay consumer electronics business. IS revenues climbed 16% to ¥441 billion ($3.4 billion), even as overall revenues rose only 13% to ¥5.2 trillion ($40.7 billion).

Net income increased 29%—less than that of other Japanese firms—suggesting that Matsushita's efforts to deal with the appreciated yen were not as successful as had been hoped. Nevertheless, international sales were strong, and the company is working toward parity in the ratio of exports to overseas production. With about 11% of sales coming from non-Japanese production plants, Matsushita still has a long way to go. In 1988, overseas production reached ¥570 billion ($4.4 billion), up from ¥425 billion ($2.9 billion) in 1987.

Four years ago, Matsushita began a program designed to decrease its reliance on consumer electronics operations. It placed special emphasis on office automation, factory automation, audiovisual equipment and semiconductors. These product areas now account for 17% of total sales, up from 7% in 1982.

In office automation, Matsushita focuses on the growing demand for home office products, which now include telephones, facsimile machines, personal computers, copiers and word processors. Matsushita also develops 32-bit workstations, and future operations will take the company into software, systems and networks.

To cope with the highly competitive Japanese business environment—made more difficult by the strong yen and trade friction—Matsushita took three steps in 1988. The company unified the fiscal periods of its group companies; reorganized its domestic sales organization by class of customer (households, government and corporate) and, in April, concluded a merger with Matsushita Electric Trading Co. Ltd. This merger unifies overseas manufacturing and sales functions while combining domestic and overseas operations.

Overall, Matsushita sees globalization as the key to transforming itself from Japan's largest consumer products company to a worldwide force in all types of electronics. At the close of 1988, Matsushita had 100 overseas locations—66 manufacturing and 30 sales companies plus four financial subsidiaries—in 38 countries employing more than 50,000 people.

Matsushita's North American Television Division, established in April, is the company's first localized integrated overseas operation. The division develops, manufactures and sells TVs for the North American market from its base in Illinois. In Europe, the firm already is assembling mobile telephones and electronic components in the United Kingdom, while continuing to increase locally made components.

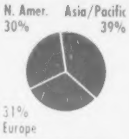
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

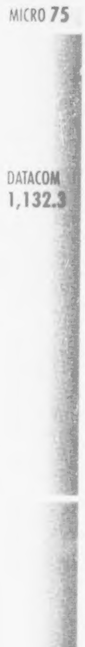
15

Total DP Revenues 3;391.6

CANON INC.

P.O. Box 5050
Shinjuku Dai-ichi
Selmer Building
Tokyo 163, Japan
(81-3)-348-2121





Canon displayed a picture perfect year: the firm set sales and income records, as office copier, laser printer and facsimile machine sales rose. Revenues climbed 13.3% to over ¥1.1 trillion ($8.6 billion), and income soared 180% to ¥37.1 billion ($289.5 million). IS and related product sales, which include personal computers, laser printers and facsimile machines,rose a strong 27% to ¥434.6 billion ($3.4 billion).

Canon took steps to continue that growth in the face of continued high exchange rates. A four-year effort to remake Canon into a global business force began in 1988. The company's plan—like those of many other Japanese companies—calls for locating manufacturing and research centers outside its home market. Early examples of the plan are already evident. In the United States, Canon Virginia Inc. began full-scale copier production early in the year and subsequently turned to laser printer production.

Canon expects to shift much of the development and production work for electronic typewriters to the United States. Moreover, the company's first technology development center in Britain was opened last year. The center, called Canon Research Center Europe Ltd., is working on computer software development, intelligent office machine interfaces and a new workstation computer language.

Canon is known largely for its laser printers. Sales of the printers again rose in the important U.S. export market, as well as in Japan. In addition, orders increased for newer technology printers, including the BJ-130 bubble-jet printer, which prints high-quality characters at 220 characters per second on plain paper.

Sales of Canon's facsimile machines in North American markets reached record levels in 1988. The company reported strong demand in Europe, where Canon has established a small but rapidly growing presence. The sales gains were aided by a series of new products.

Among these were the FAX-120, a multifunction telephone and facsimile machine that garnered a strong share of the North American market. New high-end models include the FAX-450, with features such as high-speed transmission and precise tonal gradation; the FAX-705/750, with single-operation broadcasting to as many as 173 locations; and the L6500, which accommodates both CCITT Group 3 and Group 4 standards, in anticipation of the Integrated Services Digital Network (ISDN).

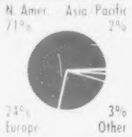
In peripherals, a joint agreement with workstation vendor NeXT Inc. provided the year's highlight. The company's peripherals business received a boost in October, when NeXT, the company launched by former Apple Computer Inc. cofounder Steve Jobs, introduced a computer incorporating Canon's erasable magneto-optical disk drive.

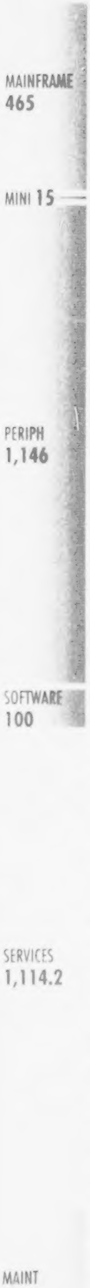
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

16
Total DP Revenues
3,254.3

CONTROL DATA CORP.

8100 34th Avenue South
Minneapolis, MN 55420
(612)-853-8100





Control Data's logo might be more symbolic of the company's current status if it were a question mark. Thirty years into a history that often saw the company playing near the summit of the industry, CDC had hoped that 1988 would mark the turnaround in its five-year struggle to remedy its financial woes. Having suffered losses in 1985 and 1986 that totaled $832 million, CDC returned to modest profitability in 1987. But it was unable to sustain that momentum and closed out 1988 with only a slim profit of $1.7 million—a margin of less than .1% on revenues of $3.6 billion.

Having failed to cure its operational troubles, CDC announced in mid-April 1989 that it would totally reorganize its operations, slashing 3,100 jobs—about 10% of its work force—abandoning the supercomputer arena entirely and cutting back its traditional mainframe operations. The company says the reshaping will cost about half a billion dollars and will shift the company's emphasis to ventures like subsidiaries Micrognosis Inc. and its Energy Management Systems Division. Rumors flew that chief executive Robert Price could not survive.

Reorganization is not new at CDC, and accounted for much of the news in 1988. Lawrence Perlman, given credit for turning around CDC's money-losing disk business, was named president and chief operating officer in December. One of his first moves as president was to reinstall Carl Ledbetter as president and chief executive officer of ETA Systems. It proved to be a short assignment.

Last summer, CDC spun off its still profitable disk operations as a separate subsidiary, Imprimis Technology Inc., supposedly in the hopes of attracting a buyer. Plans to sell the disk unit were put on hold, however, when investor enthusiasm for the competitive disk drive industry cooled. However, if CDC is compelled to sell the division, it loses its reliable supplier of both revenues and profits.

Product news out of CDC was minimal in 1988; the company was the only mainframe vendor not to announce a new large system last year. CDC did announce a midrange Cyber 960 in April 1988; delays with logic chips pushed delivery of that system into 1989.

CDC no longer packs enough weight in the computer industry to sell products based on a proprietary operating system. Its move to support UNIX last year may have come too late; by year's end, CDC still had not begun to ship UNIX-compatible machines.

CDC's VTC chip-making unit is also believed to be a candidate for disposal. Last year, VTC suffered delays in production of high-performance integrated chips and was said to have lost about $25 million.

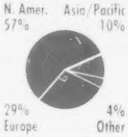
Perlman has also taken on the job of managing CDC's computer business, replacing Thomas Roberts, who resigned from his job as president of the Computer Systems Group in December.

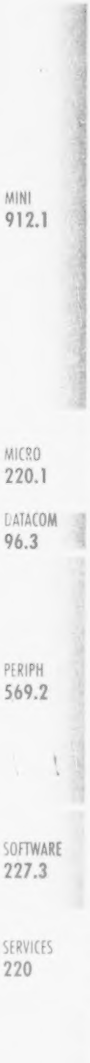
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

17
Total DP Revenues
3,074.4

WANG LABORATORIES INC.

1 Industrial Avenue
Lowell, MA 01851
(508)-459-5000





The financial turnaround that Wang Laboratories Inc. had seemed to achieve in 1987 proved short lived, as revenues stalled at $3 billion and profits tumbled 47% to $50.1 million. The downturn reflected an inability to lure new customers to Wang's VS computer family and cast a cloud over Wang's long-term outlook.

Even as midrange vendors in similar straits fled to the relative safety of niche applications or emerging UNIX markets, Wang clung tightly to its VS computer and office systems focus. Enhancements to the 32-bit VS computer line, designed to handle data, text, voice and image processing, positioned the product once again as the linchpin in Wang's future. Yet, the line was less of a lure than in years gone by.

Wang's efforts to attract new customers took several forms. For one, the company moved to lower entry-level prices by incorporating the VS instruction set in a microprocessor. The new 5000 series computers were priced to counter Digital's MicroVAX 3000 series and IBM's AS/400.

Lowering entry costs was a tactic employed elsewhere in the company. Much of the year's efforts in imaging systems, voice message services and PC local area networks, for instance, focused on low-cost packages or trial products. Wang launched nine prepackaged imaging applications for those unwilling to spend development dollars on the technology. A series of add-on boards and software to turn a PC into an integrated voice and imaging system, and free pilot trials of its voice services, also appeared. Freestyle, a PC-based system that joins image and voice applications in an à la carte fashion, continued the low-priced caravan.

Despite some 2,200 orders for the new VS 5000 series, there was little to suggest the series has appeal outside Wang's traditional customer base. A dual processor VS 7320 that began shipping early in the year and provided the company's high end similarly failed to widen customer ranks.

The focus on introductory imaging applications, and the microprocessor implementation of VS, highlights Wang's determination to make the operating system the cornerstone of an integrated voice-, data- and image-processing environment. Gloomy financial results, however, brought this strategy into serious question. Barring a major price breakthrough with the VS, or a significant reshuffling of the PC and networking markets, Wang's efforts are unlikely to return the company to the ranks of the industry's fastest growing.

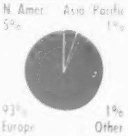
One bright sign was Wang's continued strong performance outside the United States. Bolstered by a weak U.S. dollar, sales outside the company's home market rose to 43% of total revenues. Moreover, the 8.5% sales increase in offshore revenues occurred despite a manufacturing problem in Europe that crimped VS computer sales in the fourth quarter.

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

18
Total DP Revenues
3,044.9

NIXDORF COMPUTER AG

Furstenalle 7
4790 Paderborn
West Germany
(49-5251)-150



MAINFRAME	131.1
MINI	484.1
MICRO	205
DATACOM	178.9
PERIPH	1,280.3
SOFTWARE	418.6
SERV	33.7
MAINT	313.2

West Germany's once bright star, Nixdorf Computer AG, lost its luster last year. The company managed to raise revenues 5.4% to DM5.35 billion ($3 billion), but this was only a fraction of the growth achieved in previous years. Worse than a revenue slowdown, however, was the fact that Nixdorf's core business showed a loss of DM59.8 million ($34 million) over the year. Only by selling off property did the company show a profit at all.

These adverse conditions forced Nixdorf to cut its dividend for the first time since the company went public in 1984. Nixdorf chairman Klaus Luft admitted last summer that the company probably would not return to its 1987 dividend levels until the early 1990s. Then he embarked on a course to cut losses, restructure divisions and rethink strategies.

Nixdorf reduced its staff growth in 1988 until a planned 10% rise fell to 5% by the year's end. The company also canceled a number of nonessential projects and sold off estate properties. The company said these moves would help secure its financial future and strengthen its market position.

The company held on to much of its business in the traditional markets of banking and retail, saw PC sales rise and orders for its UNIX lines begin to flow. Telecommunications products performed well, and by the end of the year over 7,700 of the firm's ISDN 8818 digital PBXs had been installed worldwide. A major order from the West German Federal Labor Office helped, as did the addition of the PBX to the product catalogue of the Italian telephone authority SIP. The strongest sectors, however, were services and micros, both of which saw strong growth.

Money from rental agreements fell by 20%, however, and the company's aggressive plans to penetrate the computer-integrated manufacturing (CIM) sector failed to bring the desired results.

Much of Nixdorf's research and development spending was focused on the development of a three-pillar product strategy: proprietary operating systems and software, UNIX-based open systems and PCs with standard software. Migration and interfacing packages are now emerging from the company to allow customers to build their own mix of systems from these three pillars. Nixdorf has supported the open systems cause in public, and this strategy represents a major effort to put its products where its mouth has been. The Targon UNIX-based computer family has been its most open product in the past. The range was extended, and the Targon PC now supports UNIX, MS-DOS and OS/2.

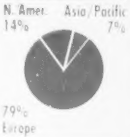
With its margins still being squeezed, Nixdorf now plans further cutbacks—particularly on staff levels, which are likely to fall by 1,600 by the end of the year. But with European competition getting fiercer, it may take much more than that to get the the relatively flat growth in revenues.

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

19
Total DP Revenues
2,794.6

NV PHILIPS GL

5621 BA Eindhoven
The Netherlands
(31-40)-79111



MINI	414.8
MICRO	308.5
DATACOM	460.3
PERIPH	902.9
SOFTWARE	184.6
MAINT	417.3
OTHER	106.2

These days, the buzz words at NV Philips GL are "core business sectors:" Four core businesses have been identified: the traditional lighting sector, components technology, consumer electronics and information technology and communications.

These core businesses produced total company revenues of F56.1 billion ($28.4 billion), but growth is slow—only a modest 6.4% increase. In the information technology sector, the Telecommunication and Data Systems Division's Business Systems Group produced F5.5 billion ($2.8 billion) in IS revenues, again a modest increase over 1987 of 5%.

During 1988, microcomputer sales increased by more than 50%, and the company hopes that the trend will continue this year. There were modest increases in the revenues from minicomputers, software, peripherals and maintenance. But data communications sales dropped by more than 10%, which augers ill for a company so heavily oriented toward communications.

Office systems, PCs, minicomputers, optical filing systems, PBXs and networking products are all part of what the company calls its "sophomation concept," which aspires to provide interconnectivity and open systems standards in these products lines.

Two products stand out: the Megadoc optical storage system and the Maestro software engineering environment developed by Softlab, a West German software house. Megadoc is one of the most successful large optical storage systems on the market. Around 100 systems are now installed, primarily in the government, banking and insurance sectors.

The Maestro product is touted as being among the first computer-aided software engineering (CASE) type products on the market. In its first days it was called a clever 4GL. But it has been very successful and has recently had a midlife boost with the launch of Maestro II designed to run under UNIX and support the emerging open systems standards. That's going to be no guarantee of survival, though. The increasing number of CASE tools hitting the market are rapidly leaving its functionality behind.

The company boosted its commitments to open systems throughout last year. It became one of the founding members of the Open Software Foundation and won some major deals for its UNIX-based P9000 systems, one from the U.K.'s Inland Revenue worth $3.6 million.

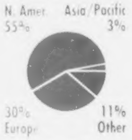
The company also strengthened its expertise in more specialized sectors last year, such as computer-aided engineering (CAE). In partnership with Silvar Lisco Inc., Philips is helping to develop specific engineering software for its own factories and for the U.S. company to market. The two companies are already partners in a research and development consortium covering CAE systems backed by the European Commission's ESPRIT research program.

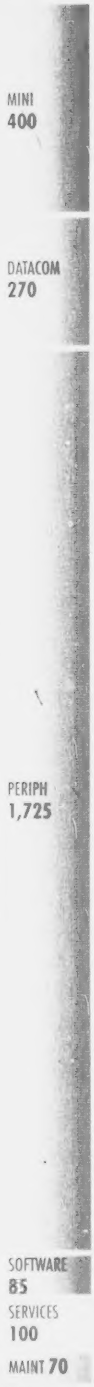
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

20
Total DP Revenues
2,650

XEROX CORP.

P.O. Box 1600
Stamford, CT 06904
(203) 329-8700





Xerox Corp. is celebrating its 20th year in the computer business in 1989, but you won't hear any brass bands. Try as it might, Xerox has never quite hit the right note in computers. Its mainframe and PC efforts went nowhere. The technology developed at its vaunted Palo Alto Research Center made plenty of money for other people—Adobe Systems Inc., Apple Computer Inc., Grid Systems Corp. and 3Com Corp. to name just a few—but never much for Xerox. When its mainstay copier business came under attack by the Japanese, Xerox sought shelter in financial services, the source of nearly half of its profits in recent years.

So Xerox's announcement in January of another strategic reorganization was an old song. Only this time Xerox may be singing for its life. This one-time glamour stock is widely regarded as a takeover target. If Xerox managers can't put their house in order, a raider might do it for them, selling off the profitable financial services part of the business—with a book value of some $3 billion—and dining out on the cash flow from the copier business.

Thus the reorganization: closing down the unprofitable medical-imaging business, scaling back in electronic typewriters, cutting 2,000 jobs, overhauling the marketing of its document-processing systems. The restructuring required a $275 million pretax write-off that reduced profits by nearly a third to $388 million, down from $578 million in 1987. Total revenues rose 8.8% to $16.44 billion. DATAMATION estimates that sales of information technology products, such as workstations, printers, desktop publishing software, facsimile machines and communications networks amounted to $2.65 billion in 1988, a 9.7% increase over 1987.

Xerox has labored to refocus its information technology efforts toward document processing. Its Ventura desktop publishing software for PCs, which it upgraded in 1988, is a hit. And Xerox is betting that FormBase, a new program for creating and publishing business forms, may be even bigger.

Efforts to sell full-blown document-processing systems using Xerox hardware have foundered because of Xerox's proprietary architecture. In 1987, Xerox announced it would adopt an open standard and move its systems to the Sun Microsystems SPARC microprocessor and the Sun/AT&T UNIX.

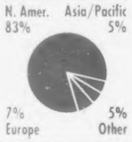
Xerox's latest reorganization changed the way the company plans to market these systems. Building on its success in selling custom systems to the government, Xerox wants to do the same for large customers in a handful of commercial markets—financial services, pharmaceuticals and aerospace, to name three big ones. A new marketing organization, Integrated Systems Operations, headed by Jay H. Nussbaum, former vice president of the Custom Systems Division, will handle sales to both the government and commercial markets.

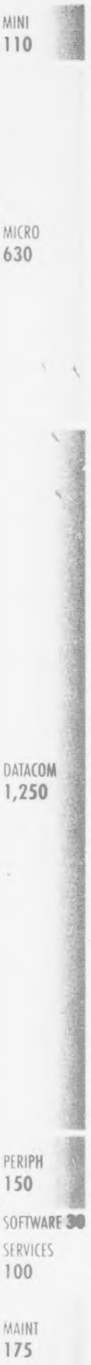
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

21
Total DP Revenues
2,445

AT&T

550 Madison Avenue
New York, NY 10022
(212) 605-5500





In 1988, its fifth post-divestiture operating year, AT&T cleaned house. It wasn't cheap. In December, the monolith took a $6.7 billion charge against earnings to speed its conversion to an all-digital network, and the company posted its first annual loss in 104 years. The move followed a year of good business. AT&T's revenue was the highest since divestiture, despite continued, though narrowing, losses from computer operations.

Entering 1989, AT&T undertook a major corporate reorganization in which it broke into 19 business units and 24 divisions. The company says the restructuring will give line executives more responsibility, boosting their ability to succeed.

Still, AT&T has not quieted critics who doubt its ability to escape from old, noncompetitive attitudes. AT&T answers this criticism by continuing the not-so-fine-tuning that began with divestiture. Last summer that meant a hiring freeze and the initial redeployment of nearly 2,000 administrative and staff employees to front-line sales positions. Streamlining continues into 1989, and word has it that AT&T will attempt to curtail expenses by up to 10%. But cost-cutting is only part of AT&T's strategy.

The company's decision to take the $6.7 billion charge for network digitization was a response to the loss of domestic long-distance business to rivals MCI Communications Corp. and U.S. Sprint Telephone Co. By the end of 1990, all of AT&T's domestic switched traffic will be carried digitally, as will all private-line facilities by the end of 1992.

Without this latest one-time charge, AT&T would have recorded its best post-divestiture year ever. Total operating revenue was $35.2 billion, up from the restated 1987 figures of $33.8 billion. The company reported a net loss of $1.7 billion, versus the $2 billion net profit earned the previous year.

AT&T continues to bleed in the computer business. Analysts believe that it lost roughly $300 million in 1988 and will lose another $150 million in 1989. DATAMATION estimates AT&T's information technology sales—including PCs, 3B minicomputers, terminals, modems and digital PBXs—to be $2.4 billion, up 22.3% over 1987's levels. Nearly half of the growth stemmed from the acquisition of Paradyne Corp., a Largo, Fla.-based modem maker.

Some of the liveliest moments of the year emerged from the UNIX community. AT&T prompted a whirlwind of activity when it decided to purchase up to 20% of Sun Microsystems Inc. during the next three years. Fearful of a powerhouse UNIX monopoly, a group from the Who's Who of the computer industry created the Open Systems Foundation to develop products around IBM's version of UNIX. AT&T and more than 30 allies then formed UNIX International Inc. The two sides continue to fight it out, each declaring its version of UNIX to be the standard.

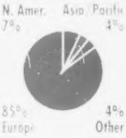
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

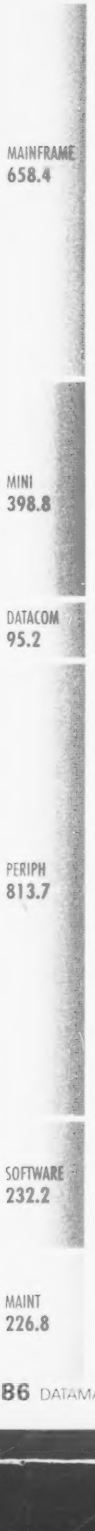
22

Total DP Revenues
2,425.1

STC PLC

10 Maltravers Street
London WC2R 3HA, England
(44-1)-836-8055





STC PLC's 14% rise in revenues for 1988 far outstrips the performance of its IS division, ICL, which saw revenues move by only 5% to £1.4 billion ($2.4 billion). Mainframe orders were slack until new models were released in late summer. The good news was that margins improved over the year from 8.5 to 9.5%, and profits were up by 16%.

The British company had a busy year with acquisitions. In February, STC bought Northern Telecom Ltd.'s DP and communications operations in Europe for £35 million ($62.3 million). In September, the company acquired IS supplier Regnecentralen in Denmark, at a cost of £6 million ($10.7 million).

In December, STC opened its checkbook on the other side of the Atlantic, buying intelligent networks and workstation company Computer Consoles Inc. for $168 million. The same month, it took control of Datachecker Systems Inc., a supplier of electronic point-of-sale systems, for $90 million.

Back at home, it was also a year of cost cutting. ICL managed to reduce inventory from its 1984 level of $390 million to $245 million in 1988. The division now turns over inventory four times a year, and the target is six times a year—saving another $53 million between now and the end of 1990.

On the product side, the company fears the tightening margins that standards and open systems will bring and is focusing much of its activities on building up its software and services operations. Even so, sales of its UNIX-based departmental systems doubled, and the company picked up a new product—the RC 9000 fault-tolerant UNIX system—through its acquisition of Regnecentralen.

In August, ICL added a new multinodal version of its series 39 mainframes. Called the extended performance (XP) processor series, the new system offers a claimed 35% increase in price performance and a doubling of memory to 32 megabytes. ICL's fast-search system—the Content Addressable File Store—is standard in that system. The range consists of three new entry-level systems (15XP, 25XP and 35XP), two dyadic processors (25DXP and 35DXP) and one two-node system (35XP2).

The company is looking to foreign markets for much of its growth this year, particularly the United States, where the ICL Datachecker operation ranks among the world's top three in-store retail systems suppliers. The company also reports sales to the Eastern Bloc to be growing since the relaxation of Western export trading rules.

But one international problem that just won't go away is the controversy over ICL's involvement in South Africa. An internal ICL memo surfaced last year revealing that the company was still maintaining control of its South African operations—despite the company's apparent withdrawal from the market—and that employees should be informed of this involvement only on a need-to-know basis.

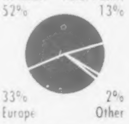
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

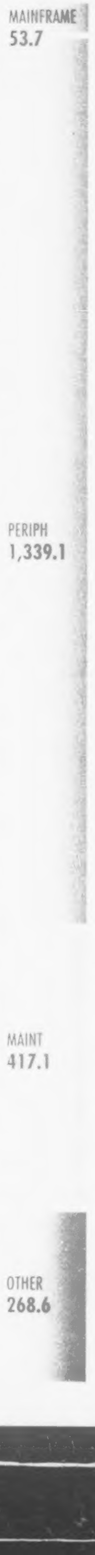
23

Total DP Revenues
2,078.5

MEMOREX TELEX NV

Hoogoorddreef 9
1101 BA Amsterdam ZO
The Netherlands
(31-20)-97-4331





Business lingo will never be the same again. The machine in the corner of the office that taps and clatters away with reassuring regularity may now become known as a "Memorex Telex." The extra syllables come from the January 31, 1988 merger of Telex Corporation and Memorex International, the company formed in late 1986 after breaking away from Unisys.

Headquartered in Amsterdam, Memorex Telex began life with more than 1,300 staff, operations in 26 countries and distributor links in 50 others. It claims to be the world's largest supplier of plug-compatible computer equipment and accessories.

During 1988, revenues for the merged company rose more than 100% from combined sales of around F2.1 billion ($1 billion) in 1987 to a consolidated total of F4.2 billion ($2.2 billion). IS revenues, primarily sales of computer peripherals, accounted for over 90% of that total.

Memorex Telex's product spread encompasses computer supplies; 3270-compatible systems especially for the airline, travel and communications industries; large systems and departmental peripherals and networking and telecommunications equipment.

In December, the company extended its involvement in the networking sector by becoming a founding member of the Open Token Foundation, created to promote interoperability between token ring products based on the IEEE 802.5 and the Fiber Distributed Data Interface standards.

In the first major marketing move since the merger, Memorex Telex set up a new PC organization earlier this year. Called Intelligent Systems (ISYS), it is run by former Telex U.K. chief Richard Slogrove and is based in Tulsa, Okla. Product planning and engineering is based in Milpitas, Calif.

ISYS' first products are safe and proven. Grouped under the series 7000 banner, they include Intel processor-based MS-DOS PCs incorporating the standard 8088, 80286 and 80386 chips; communications products; extra storage and displays; a range of printers, including laser printers, and a variety of standard software. By the end of November 1989, the company expects revenues from ISYS to hit $150 million, and to double a year after that. In the PC business, distribution is the key to success and, with Memorex Telex's combined networks of subsidiaries and distributors, the company stands a good chance of coming close to its targets.

The company is also trying to grow by acquisitions, but with little success so far. It made a bid for the plug-compatible mainframe company National Advanced Systems Corp. but was outflanked by Hitachi Corp. and GM's Electronic Data Systems Corp. The company is still looking for targets though, particularly in the mainframe peripherals market.

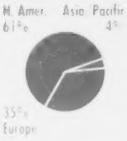
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

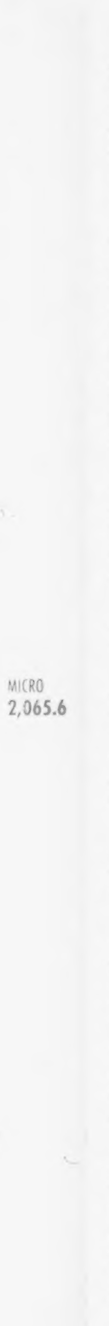
COMPANY PROFILES

24
Total DP Revenues
2,065.6

COMPAQ COMPUTER CORP.

20555 State Highway 249
Houston, TX 77070
(713) 370-0670





As it seems to do every year, COMPAQ Computer Corp. broke another record in 1988, becoming the first company to reach $2 billion in sales in only five years of existence. In doing so, Compaq held tight to its title as the top supplier of IBM-compatible PCs to corporate America. The company's 1988 sales rose by 69.7% over 1987 figures, rising to $2.07 billion from $1.22 billion.

In the midst of this happy news, Compaq continued to release new models based on the latest Intel Corp. technology. As has become the standard operating procedure in the PC world, Compaq beat IBM out of the box with a PC based on Intel's new 80386sx chip. Last year, Compaq introduced its long-awaited laptop. The computer combined battery-powered 80286 technology with new power conservation features and flat-panel video graphics technology. With Dataquest Inc. predicting a $3.2 billion market for laptops by 1990, Compaq was anxious to have a product to offer its business users.

In May, Compaq and Digital Equipment Corp. announced a technology exchange agreement to ensure connectivity of their products. Though not a breakthrough for the company, it reemphasized Compaq's role as a major player in the corporate computing world.

While there was little out of the ordinary in these announcements, the company did deliver one shocker: the Extended Industry Standard Architecture (EISA) consortium. In September, Compaq joined 70 other PC vendors to announce the EISA consortium, which promised to offer an alternative to the IBM-designated MicroChannel Architecture-based PCs. No one company has taken the lead in the consortium, but Compaq has the most to gain, or lose, from the success of the group.

Girding itself for battle, Compaq fielded a vocal proponent of EISA, Joseph R. Canion, president and chief executive officer of the company, who traveled the country in support of EISA.

No machines bearing EISA will be available until late 1989, so the real battle between the two competing architectures is a ways off. Still, the seriousness of the battle was indicated in an early skirmish between Compaq and Businessland Inc. In February 1989, Compaq severed its six-year relationship with the San Jose, Calif.-based computer retail chain, citing a disagreement with the chain over its emphasis on sales of IBM's MicroChannel-based PS/2 personal computers.

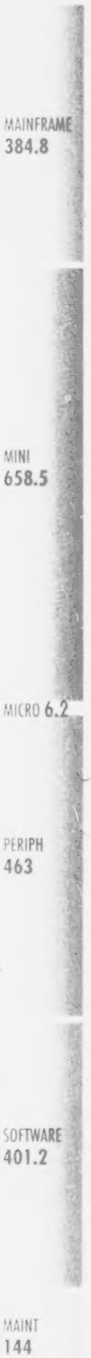
Despite the potential for trouble inherent in its EISA strategy, Compaq has been selling all the machines it can manufacture and continues to increase its sales overseas, as well. In 1988, 40% of the company's revenues were earned outside the United States, will the largest portion coming from Europe. According to Dataquest, Compaq is the fourth-leading supplier of PCs in Europe.

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS.

25
Total DP Revenues
2,057.7

NIHON UNISYS LTD.

17-51 Akasaka, 2-chome
Minato-ku, Tokyo 107, Japan
(81-3) 585-4111



On April 1, 1988, the public company Nippon Univac Kaisha Ltd. (NUK) merged with the wholly owned subsidiary of Burroughs Co. Ltd. in a move engineered by NUK, Unisys Corp. and Mitsui & Co. Ltd. The resulting company, Nihon Unisys Ltd., immediately became the fifth-largest computer company in Japan. One-third of it is owned by Unisys, one-third by Mitsui and one-third is traded on the Tokyo Stock Exchange, with capital participation by Oki Electric Industry Co. Ltd. and Mitsubishi Electric Corp.

By adding Burroughs' small and medium-sized systems, the move balanced out Nippon Univac's product offerings, which had been dominated by large computers. It also increased the user base and potential user base for both companies. Geographically, the companies were complementary, with Nippon Univac in the large cities and Burroughs in localities. The company says its Japanese customers' needs now are more precisely reflected in the worldwide Unisys development program and, more important, the company can now be a systems integrator.

As a product supplier, Nihon Unisys manufactures 10% of its hardware, imports 40% from the United States and obtains 50% from other Japanese vendors. Ninety percent of operating system software is developed in the United States, 10% by Nihon Unisys. Conversely, 90% of applications software is developed by Nihon Unisys and its affiliates, with 10% coming from the United States.

Rising profits offset associated internal reoganization costs. Revenues increased 40.8% to ¥263.7 billion ($2.1 billion) in 1988, led by demand for the firm's medium-sized and large computers. Net income rose 20.9% to ¥3.5 billion ($27.5 million).

Major product announcements over the last year span the firm's entire product line. They include 32- and 16-bit SB8/28 workstations; a 32-bit SS-7 engineering workstation; the KS-303 AI workstation; the PW family of workstations for OS/2, MS-DOS and AX (Japan's version of MS-DOS) operating systems; the S500J high-speed document-encoding system; the DP1000 high-speed MICR reader-sorter; the AGS500 graphic display system; the Link family of hybrid multiplexers; the Series 8 office computer; U5000/85 and U6000 UNIX processors; the A4/A6-FX 400 advanced medium-scale general purpose computer; the A12-1 large-scale general purpose computer; the 2200/600 high-end large-scale general purpose computer and Open Systems Interconnection software for mainframes.

Perhaps the firm's most significant announcement was the Micro-A, ambitiously billed as the world's first desktop mainframe. Housed inside a Unisys PW/2 series 800 PC, the Micro-A uses a semiconductor and packaging technology called SCAMP (Single Chip A-Series Mainframe Processor).

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS.

26
Total DP Revenues
1,965

TRW INC.

1900 Richmond Road
Cleveland, OH 44124
(216) 291-7000

While TRW Inc.'s overall information systems and services revenues were flat for 1988, the reputation the company achieved over the same period for building large-scale, image-based information-processing systems began to bear fruit at the end of the year. Boosting investment in new products for its fledgling image-based data-processing group, Information Systems Engineering Equipment and Services (ISEES), paid off, and the momentum increased in 1989.

An example of the kinds of image-processing contracts TRW won in 1988 is a $5 million contract from the U.S. Postal Service. TRW will provide and test an image-processing system capable of handling 90,000 pieces of mail per hour, assigning nine-digit zip codes to mail not readable by machine.

Despite its success in image-processing, business in the Electronic Equipment Maintenance (EEM) group—the third-party maintenance business unit that includes ISEES—was down 11% to about $160 million. Pared down product lines among the major computer vendors were responsible for that blemish on TRW's 1988 balance sheet. In doing third-party maintenance contracts for IBM and Xerox Corp., among others, TRW normally acquires parts from computer makers' discontinued product lines. In 1988, many companies were not offering as many models, so the amount of old or outdated equipment available was down considerably. Consequently, the company says, it could not respond to service calls as quickly as it might have hoped.

SERVICES
1,805

The maintenance business may have suffered further because of the company's decision, for the second half of 1988, to divert funds from the purchase of spare parts to new product development.

All in all, business was basically flat, with 1988 revenues at $1.97 billion in the conglomerate's Information Systems sector, which includes the business units EEM, TRW Credit Information Services and Real Estate Information and Services.

In the first quarter of 1989, the third-party maintenance business continued to be flat, but particularly strong performances were registered from the consumer credit-reporting and image-processing businesses. First-quarter sales of the Information Systems sector were $141 million, a 12% increase over the 1988 first-quarter figure of $126 million.

The separate Space and Defense sector, which handles military and space-related information systems, was TRW's top scorer in 1988. TRW reports that it benefited from Strategic Defense Initiative contracts, under which TRW develops artificial intelligence and command-and-control systems. One example was a $20 million one-year contract won by TRW's Federal Systems group in Washington, D.C., to provide an interactive, bilingual command-and-control information system for about 400 workstations and graphics terminals for the U.S. Army.

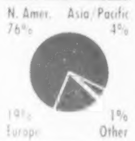
MAINT
160

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

27
Total DP Revenues
1,907.6

ELECTRONIC DATA SYSTEMS CORP.

7171 Forest Lane
Dallas, TX 75230
(214) 661-6000



Electronic Data Systems Corp.'s apparently unending legal skirmishes with founder Ross Perot did not keep General Motors Corp.'s IS superpower from setting yet another record for revenues, net income and earnings per share. The best news was that non-GM revenue soared 32.4%, from $1.44 billion to $1.90 billion. (IS revenues in the DATAMATION 100 do not include revenues from sales by one unit of a company to another.) Combined with a slight drop in GM's own contribution to EDS' overall health—from $2.88 billion to $2.84 billion—EDS' "base business," as the company calls any deal done outside the GM womb, rose from 33% of its overall revenue to 39%. That was just about the split EDS had hoped to achieve.

"The growth in our base business was the most gratifying event of the year," says Stuart Reeves, EDS' senior vice president. "We also began to see the marketing payoff from the skills, technology and know-how we're getting from our GM relationship. We finally started to leverage those skills into deeper penetration of our existing traditional markets."

Always a star player in financial services, EDS hit nova status in 1988. It signed its largest contract ever, a 10-year facilities management agreement with First City Bancorporation of Texas, the fourth-largest bank-holding company in the state. EDS' government systems and financial and insurance groups combined to win another megacontract, agreeing to provide the New Jersey Automobile Full Insurance Underwriting Association with full program management services to 425,000 policy holders. EDS also made its mark in the commercial arena, finalizing a contract to integrate manufacturing systems for Caterpillar Inc. and landing a 10-year deal with Freeport-McMoRan Inc. to handle the New Orleans-based mining company's MIS, computer operations and voice communications.

SERVICES
1,907.6

In the government sector, there was a six-year deal to implement unified LAN architecture for the Air Force, a five-year contract with the Marines to automate supply services and an eight-year pact with the Navy to convert the application support system for Stock Point ADP Replacement Conversion.

And GM chipped in with a five-year agreement for information-processing services to its Automotive Components Group and a four-year extension to an agreement with the Truck and Bus Group.

EDS was also heavy into acquisitions, picking up a 50% interest in China Management Systems, a huge Taiwan-based IS operation; purchasing MTech Corp., which operates the third-largest ATM network in the United States; and annexing the data-processing operations of two Texas banks. This was small stuff, though, compared with this year's first-quarter deal with Hitachi Ltd., in which the two parties agreed to buy National Semiconductor Corp.'s National Advanced Systems subsidiary.

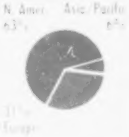
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

28

Total DP Revenues 1,801.8

AMDAHL CORP.

1250 East Arques Avenue
Sunnyvale, CA 94086
(408) 746-6000



MAINFRAME 1,225.2
DATACOM 90
PERIPH 216.4
SOFTWARE 12
SERVICES 24
MAINT 234.2

You might imagine that 1988 was a tough year for IBM-compatible mainframe pioneer Amdahl Corp. After all, popular wisdom has it that new applications are bypassing mainframes in favor of networked personal computers and workstations. The year saw IBM turn up the competitive heat when it began to ship both its new MVS/ESA operating system and 3380 model J and K disk drives, products Amdahl wasn't able to counter last year.

Still, in 1988 Amdahl continued its march up the DATAMATION 100 with a record $1.8 billion in revenues, up 19.7% over 1987's $1.5 billion revenue figure. Earnings jumped to $223.3 million, up 53% over 1987's level. The hot numbers were due to heavy demand for Amdahl's highly reliable 5890 mainframe, which competes with IBM's 3090 family. Altogether, Amdahl shipped over 300 processors in 1988, another record for the company. And the lack of 5890 support for IBM's new ESA operating system upgrade didn't seem to slow demand for the plug-compatible CPU. Most customers seemed satisfied with Amdahl's promise of ESA support by the fourth quarter of 1989.

In May, Amdahl scored another first. The company shocked the industry by announcing its next-generation mainframe family, the 5990, before IBM announced its upgrade 3090S series rather than waiting to react to IBM's marketing initiative. Based on technology from Fujitsu Ltd., the largest 5990 (the $13.1 million model 1400) was rated by the experts at 115 million instructions per second. That made it almost 50% faster than IBM's then-largest mainframe and seemed to swing the mainframe market and momentum toward Amdahl. By the end of the year, Amdahl had shipped over 40 of its 5990 mainframes. The company has predicted that 1989 CPU shipments will exceed 1988 numbers.

Amdahl also took a bold step in the storage arena. Although in 1988 the company continued to trail IBM's 3380 model J and K technologically, Amdahl did announce a radically new controller device. Amdahl's new 6100 controller, which started shipping in the fourth quarter of 1988, combines up to 32 input/output paths in a single controller. The result, says Amdahl, is faster total throughput and greater flexibility for the user.

Amdahl also continued to demonstrate its commitment to open systems and the UNIX operating system. Amdahl became a member of UNIX International, the AT&T-associated consortium attempting to establish UNIX System V as an industry standard. Amdahl also continued its own internal UNIX development work. In early 1989, the company announced a major new release of its UTS mainframe which, for the first time, incorporated standard UNIX features such as the Network File System and selected features from the Berkeley Software Distribution 4.3 version of UNIX.

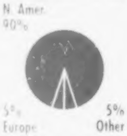
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

29

Total DP Revenues 1,792.4

TANDY CORP.

1800 One Tandy Center
Fort Worth, TX 76102
(817)-390-3700



MICRO 1,232.2
PERIPH 409.6
SOFTWARE 150.6

In 1988, Tandy Corp., to use an apt Texas phrase, was as busy as a bobcat in a tow sack. Tandy inked numerous partnering deals with other manufacturers, announced an erasable compact disk and shipped one of the first IBM PS/2 clones. And in decidedly atypical actions, Tandy bought another company and began to sell its computers outside its familiar Radio Shack retail stores.

The first tipoff that 1988 would be an unusual year for Tandy came in March when Tandy purchased Grid Systems Corp., a Freemont, Calif.-based manufacturer of laptops and portable computers for the corporate and government markets. Tandy has given Grid Systems responsibility for all computer marketing efforts aimed at large businesses. Several of Tandy's high-end computers will be resold under the Grid label. Tandy hopes to avoid the home computer taint of its Radio Shack label, which seems to put off business customers.

In April, Tandy announced it would bring to market an erasable compact disk within the next few years. The company also introduced the Tandy 5000 MC, one of the first PCs compatible with IBM's high-end PS/2 models using the MicroChannel architecture. In any other year, that would have been the big news for Tandy.

But in June, breaking the hallowed tradition of selling its PCs exclusively through its Radio Shack stores, Tandy began offering some of its computer models through the Wal-Mart chain of department stores. And in October and November came two more surprises. First, Tandy announced an agreement with Digital to develop a new line of PCs to be sold under the Digital label. Then at Comdex, Tandy announced it was teaming up with Matsushita Electric Industrial Co. Ltd. (known in the United States for the Panasonic, Quasar and Technics brands) to resell its domestically manufactured PCs under the Japanese company's various labels to the U.S. market.

In many ways, those moves should have been expected. Tandy's Radio Shack outlets sell a lot of computers—401,000 in 1988 to be exact—but Tandy executives say PC sales outside the Radio Shack channel could reach 100,000 in 1989.

Tandy may need the help. DATAMATION estimates that Tandy's 1988 PC sales amounted to $1.79 billion, only a slight increase over 1987. And Tandy ran into a few problems at the end of the year. With memory chips in short supply, Tandy's low-end 8086 and 8088 PCs, traditionally big sellers at Christmas, were left waiting for customers during the December retail rush. Customers opted for Tandy's 80286 machines, which were in short supply by the time Santa came to get his supply. But Tandy doesn't see that year-end slowdown as firm evidence that its customers are moving to higher end PCs, and it still plans to market and improve the low-end models.

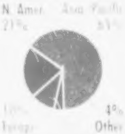
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

30

Total DP Revenues 1,727.5

RICOH CO. LTD.

15-5 Minami-Aoyama 1-chome
Minato-ku, Tokyo 107, Japan
(81-3)-242-5415



MINI 27.6

MICRO 393.2

DATACOM 850.3

PERIPH 230.7

SOFTWARE 93

MAINT 132.7

The emphasis Ricoh Co. Ltd. has been placing on its computer division—selling Hitachi Ltd. PCs and IBM System/55s and System/36s on an original equipment manufacturer (OEM) basis and acting as a sales agent for NEC Corp. office computers—appears to be paying off. Sales of Ricoh's information systems continued at a brisk pace, increasing by 20% to ¥221.4 billion ($1.7 billion). Personal computer sales, for example, which were estimated at ¥50.4 billion ($393.2 million), buoyed domestic IS growth.

Ricoh hopes to develop its computer business into another "earnings pillar" in its office automation equipment business, along with its copier business. Specifically, it aims to double sales of PCs and office computers to 70,000 units and 10,000 units, respectively, by fiscal 1990. To support the push, Ricoh plans to increase the number of its system engineers in those of its companies that distribute office equipment. It also intends to double its group sales staff to over 4,000 people by fiscal 1990.

The company's printer and facsimile businesses turned in solid performances, being primarily responsible for a 24% increase in Ricoh's overseas revenues. The company expects Japanese user requirements to broaden and for Group IV facsimile machines and multifunctional peripherals to therefore gain in popularity. The Communications Industry Association of Japan predicts that the export market for fax machines will grow an average of 15% annually through 1990.

Offshore production of both printers and fax machines is increasing. Last year offshore facsimile production increased by 50%, and Ricoh Electronics Inc., a Tustin, Calif. subsidiary, is scheduled to manufacture laser printers.

Unfortunately, Ricoh has been experiencing difficulties with its new LP6000 laser printer—a fair number of which have already been shipped and sold—in which excess toner is transferred to the page being printed. Confusion over who is responsible for maintenance and repair (the LP6000 is sold both under the Ricoh brand and through OEMs and distributors) has compounded the problem.

Ricoh's management, in trying to globalize its organization, initiated measures to create an independent North American operation. Accordingly, a third Tustin manufacturing plant has begun producing printer assemblies, complementing the activities of the firm's Irvine parts-processing plant and Santa Ana supply plant. Plans for a fourth manufacturing facility, near Atlanta, were also announced. Similarly, Ricoh plans to create a separate European operation designed to increase production capacity. In Japan, Ricoh completed a printed circuit board plant in Tottori Prefecture and added a new wing to its Research Institute of General Electronics in Miyagi Prefecture.

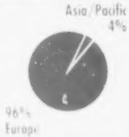
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

31

Total DP Revenues 1,716

ALCATEL NV

33 rue Emerian
75017 Paris, France
(33-1)-40-58-52-68



MICRO 118.3

DATACOM 721.9

PERIPH 710.1

SOFTWARE 106.5

OTHER 59.2

Two years of restructuring may have made Alcatel NV a stronger company internally, but revenues in many areas have suffered as a result. Alcatel reports its accounts in European Currency Units (ECUs). Total revenues fell slightly in 1988 to ECU11.1 billion ($13.1 billion), down from ECU11.2 billion ($12.9 billion) in 1987, although net income was up 21.6% from 1987, to ECU421 million ($497.9 million).

While the company's core public-switching business continued to expand, its DP and data communications operations contracted as a result of continued divestitures in Europe and the United States. IS revenues decreased 18.5% to ECU1.45 billion ($1.7 billion), from ECU1.78 billion ($2.1 billion) in 1987. Sales of microcomputers dipped 29% to ECU100 million ($118.3 million), while revenues from data communications equipment dropped 32.2% to ECU610 million ($721.9 million).

Alcatel began life in January of 1987, following the merger of all the IS interests of France's Compagnie Générale d'Électricité (CGE) and ITT's former European telecommunications interests, which CGE acquired in December 1986. CGE has a 61.5% controlling interest alongside ITT's 37%.

The continued divestiture program of various inherited IS interests led to Alcatel's retreat from the U.S. market during the year after selling Qume Corp. and ITT's old Courier 3270 operations. In Europe, Alcatel unburdened itself of Danish services company Regnecentralen.

Alcatel has an estimated 18.5% of the worldwide public-switching market, putting it in second place after AT&T. Alcatel's worldwide business communications and IS activities, along with office equipment in general, are now grouped into a horizontal division called Alcatel Business Systems (ABS), which had 1988 revenues of ECU2.67 billion ($3.13 billion). Some 42% of that total was derived from voice and data terminals, with 31% coming from PBXs.

The main ABS subsidiaries are Face in Italy, Kirk in Denmark, SEL in West Germany, STK in Norway and Telic in France. Telic Alcatel, based in Paris, reported sales of FF3.888 billion ($652.8 million) in 1988. The subsidiary is France's leading supplier of private telephone equipment—with over 52% of the market—and the country's biggest producer of faxes (50,000 units in 1988).

Telic is the world's largest vendor of videotext terminals (551,000 units shipped in 1988). Telic has centralized production of most product lines in a futuristic new plant in Illkirch, near Strasbourg, France, inaugurated in September 1988.

Alcatel continues to market the Micromega range of multiuser micros supplied by Fortune Systems Corp., but has now added UNIX workstations from Convergent Inc. to its catalogue. The machines run Alcatel's UNIX-based operating system, ALTIX.

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

32

Total DP Revenues 1,694

NIPPON TELEGRAPH AND TELEPHONE CORP.

1-6 Uchisaiwaicho 1-chome
Chiyoda-ku, Tokyo 100, Japan
(81-3)-509-5035

DATACOM
508.2

SOFTWARE
186.3

SERVICES
847

MAINT
152.5

Last year, Nippon Telegraph & Telephone created a major new data communications subsidiary. The unit, NTT Data Communications Systems Corp., grew out of the transfer and reorganization of its Data Communications Sector. The company describes the goals of its new subsidiary as improving customer service and lowering the cost of its data communications operations.

With 6,800 employees and an initial capitalization of ¥10 billion, NTT Data will provide telecommunications services for Type II carriers—those that lease rather than own their telecommunications circuits and facilities. In addition, the new operation will develop, maintain, sell and rent data communications systems, peripherals and software and engage in data communications services.

IS revenues rose 33% to ¥217.1 billion ($1.7 billion), only a fraction of the company's ¥5.5 trillion ($42.9 billion) total revenues. Yet, IS represents a fast-growing business for the company and one with plenty of potential.

In fact, some industry observers feel that pressure from smaller competitors is forcing NTT to focus its efforts in the data communications business. NTT predicts the new subsidiary will see profits of about ¥8 billion ($62.4 million) on revenues of ¥262 billion ($26 billion) in 1990. Moreover, it predicts profits will rise fully 75% in fiscal 1991.

However fast growing its subsidiary, NTT has some serious problems in its mainstay operations, some of which stem from its reported involvement in the so-called Recruit Co. influence peddling scandal. NTT officials allegedly accepted bribes in the form of prelisted Recruit stock and sold two Cray Research Inc. supercomputers to Recruit under questionable circumstances. As a result, the Tokyo Metropolitan government in early 1989 excluded the telecommunications giant from the Tokyo Teleport Town project, a ¥128.1 billion ($1 billion) international computer and communications operation scheduled for completion in early 1994. To compound the problem, the city of Yokohama temporarily suspended NTT from public works contracts.

Even as the scandal simmers, NTT is under considerable pressure to continue on a path similar to AT&T's government-ordered breakup. In addition, the large number of new telecommunications and data communications entries is eroding NTT's previous position. As a result of this newly competitive atmosphere, NTT has been forced to cut its rates.

In April, NTT began offering integrated services digital network (ISDN) capabilities in Tokyo, Nagoya and Osaka. Current plans call for the services to be extended to other major Japanese cities. But the company has said that further advances in digital telecommunications will be required before nationwide ISDN services can become available.

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

33

Total DP Revenues 1,617

AUTOMATIC DATA PROCESSING INC.

1 ADP Boulevard
Roseland, NJ 07068
(201)-994-5000

SERVICES
1,617

Automatic Data Processing Inc., the grand old party of the batch-processing service providers, continues to change its look. Batch is out and interactive is in. With a new chief operating officer, William J. Turner, a new president for its Brokerage Information Services Group, AT&T veteran Robert Casale, and a raft of new managers, ADP is revamping its technology, moving further toward on-line services for its customers. Why now, with revenues up 10.2% for the year to $1.62 billion, and profits up just a hair under 19% to $178.2 million? As handsome as those numbers appear, they represent the lowest annual increase in revenues in recent years. But, ADP has wrung more profits out of each revenue dollar, and last year profits hit 11% of sales. The revenue increase maintained ADP's record of having scored at least 10% revenue rises each year since the company went public in 1961.

ADP's best known service, the preparation of payrolls for companies large and small, now accounts for half of its revenues and employees. According to ADP, each payday in 1988, the company handled 200,000 payrolls in Brazil, Canada, the United States and Western Europe.

In 1988, the Brokerage Information Services Group kicked in 25% of ADP's business. During ADP's fiscal year, ending in June 1988, capital expenditures of $187 million were over twice the amount spent in each of the previous years. Most of the money—$100 million—went into brokerage services. The inspiration was the meltdown on Wall Street: in the week of October 19, 1987, ADP handled transaction volumes that passed 500,000 transactions each day; each day it processed more than 3 million real-time messages and orders and delivered more than 14 million stock quotes.

Equipping itself to handle huge volumes was complicated by a move of ADP's processing center from New York to Jersey City, N.J., and a move to more distributed processing based on IBM PS/2s. ADP's chief competitor in the stock quote business, Quotron Systems Inc., bought by Citicorp in 1986 for $860 million, lost business to ADP at big accounts like Merrill Lynch and Shearson Lehman.

ADP's edge is technology. While Quotron still relies on dumb terminals to deliver the goods, ADP is moving to PS/2s to deliver multisourced data—some of it customer generated, some supplied from ADP's computers—that can then be manipulated on the PCs. The system is called FS Partner.

Dealer Services is ADP's third-largest business, providing 16 different services to more than 6,500 automobile, truck and heavy equipment manufacturers and dealers in the United States and Canada. ADP's Banking Services Group serves more than 25,000 ATMs nationwide. Monthly ATM transaction volume grew by 50% from 1987, reaching more than 12 million transactions per month.

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

34
Total DP Revenues
1,594

PRIME COMPUTER INC.

Prime Park
Natick, MA 01760
(617) 655-8000

It's nature's law and that of the corporate jungle, too: sooner or later, the hunter becomes the prey. Prime's turn came in the fourth quarter of 1988, seven years into a growth-by-acquisition strategy that has tripled the company's size and vaulted it to revenues of $1.59 billion. This is tantalizingly close to the $2 billion "critical mass" that then president and chief executive Joe Henson, the architect of this strategy, was aiming for by 1990.

MINI
623.7

Prime's fourth quarter should have been a time of celebration. The trauma of the company's Computervision Corp. takeover (completed in February 1988) had eased, and Prime was now a solid number 2 after IBM in the lucrative computer-aided design/manufacturing (CAD/CAM) market. By October, the company was ready to buy Calma Co. from General Electric Co. to reinforce its position. But Prime would soon reel under a hostile takeover bid, layoffs, restructuring and Henson's resignation.

By March of 1989, the month Prime announced it was for sale, it was clear it would lose its independence, as well. Company insiders expect the likely buyer, MAI Basic Four Inc., to sell off Prime's assets—especially Computervision.

To frustrate such a move, Prime is reorganizing into three autonomous geographic business units—the Americas, Europe and the Middle East, and the Far East—each with separate profit and loss accounts. Prime's hope was that the layoffs of about 1,200 employees, 10% of the work force, coupled with the restructuring, would make the company more attractive as an independent concern.

PERIPH
313.1

The minimaker has made no secret of its desire not to be acquired by controversial investor Bennett S. LeBow, MAI Basic Four's controlling party, and would prefer instead a "white knight" such as its biggest customer, Ford Motor Co.

SOFTWARE
97.2

One central question is: What will happen to Prime's traditional minicomputer business? Some 60% of the company's research and development is still dedicated to large minis even though the market growth is in CAD/CAM, and the minicomputer is perceived as dying. Prime has built up an enormous franchise over the past 17 years; its 50 series customers currently number 23,000 worldwide. But these customers want reliability more than innovation.

Prime's plan had been to integrate its minis into a wider vision—labeled Computer-Aided Business (CAB)—whereby the machines could play a vital role as network hubs. Will this be the new buyer's vision?

MAINT
560

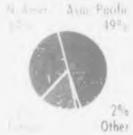
Meanwhile, the company announced a push into consulting services and the first standardized pricing of related packages and products. Prime also added two more EXL supermicros: primarily UNIX-based systems that also combine PICK and MS/DOS. Then there is System 9, a hot new geographic information system product Prime recently purchased from Swiss company Wild Leitz.

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

35
Total DP Revenues
1,487.7

SEIKO EPSON CORP.

80 Hirooka-shi Jiirishi
Nagano-ken 392
(81-0266) 52-2552



Seiko Epson Corp. was founded in 1985 to contain several business operations, some of them more than a century old. Its best known products are Seiko watches and Epson printers and PCs.

MICRO
282.7

Seiko Epson's strategy divides the world into four interdependent zones: North and South America, Asia and the Pacific, Europe and Japan. Each zone is responsible for all of its business activities—from product design and planning through production and sales.

Mitsuhiro Tsuchihasi, senior managing director and corporate general manager of sales and marketing, describes the evolution of the firm's international business operations as a process that began at "isolated points" (individual companies), which were then joined into "lines" (several companies) and "planes" (zones). The final structure is meant to function like a network. Seiko Epson says the new setup is intended to foster a global consciousness among its employees and, at the same time, reorganize existing managerial structures. According to the company, sales and production activities already operate under this global, multilocal strategy.

In the IS business, Seiko Epson is best known as a printer company. Each month, the company says it makes more than 1 million printer mechanisms, accounting for more than 60% of the world's printer mechanism market share. Its printheads are used in calculators, point-of-sale terminals, electronic cash registers and airline boarding pass and ticket printers as well as in computer printers.

IS revenues were up 10% to ¥190.6 billion ($1.5 billion). Total revenues were ¥349.1 billion ($2.7 billion), an increase of 11.6%. R&D expenditures were ¥31.8 billion ($248 million), up 12.8% from 1987, amounting to 9.1% of revenues.

PERIPH
1,205

Epson America Inc. along with Epson Canada Ltd. and Epson Latin America Inc. are Seiko Epson's Western hemisphere marketing affiliates. Headquartered in Torrance, Calif., Epson America claims the largest share of the market for nine-pin and 24-pin printers sold through computer store distribution channels in the United States. Epson America also lays claim to between 4.6% and 6% of the U.S. personal computer market.

In 1988, other activities outside Japan included establishing Epson Engineering France for R&D purposes, opening the Epson Technology Center in Silicon Valley to coordinate R&D in the United States, manufacturing PCs at Epson Telford Inc. in the United Kingdom, establishing Epson A/S in Denmark and establishing Tianjing Epson Co. Ltd. in China.

Seiko Epson has announced the world's first 48-pin printhead, incorporated in the Epson TLQ-4800. The firm has also developed the world's first full color video projector based on a liquid crystal panel and miniaturized optical system.

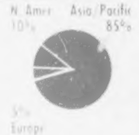
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

Advances in chip technology allow most hardware suppliers in the Top 100 to continue to boost the performance of their systems while holding prices steady.

36
Total DP Revenues 1,472.1

OKI ELECTRIC INDUSTRY CO. LTD.

7-12 Taranomon 1-chome
Minato-ku, Tokyo 105, Japan
(81-3)-501-3111



MINI **125.1**
MICRO **19.1**
DATACOM **279.7**
PERIPH **913.3**
SERV **98.1**
MAINT **36.8**

All three of Oki's business segments (telecommunications systems, information-processing systems and electronic devices) showed firm sales in 1988. Total revenues climbed 19.6% to ¥552.6 billion ($4.3 billion), with IS sales up 14.7% to ¥188.7 billion ($1.5 billion). Manufacturing operations were stepped up, resulting in increased profitability. Despite being hampered by exchange rates and trade frictions, Oki took advantage of the strong yen to raise overseas procurement and increase the output of new products.

In December, Oki commenced operations at a new plant in Miyagi Prefecture, where ultra-large-scale-integrated (ULSI) circuits, such as the firm's 1-megabit dynamic random access memory, will be manufactured. In the future, the plant will manufacture 4Mb DRAMs. In the United States, Oki is expanding its mobile telephone plant capacity and is constructing a printer plant. Integrated circuits (ICs) will be produced at an as-yet-unidentified European site, in addition to its existing printer plant in Scotland.

In Japan, Oki plans to relocate its Tokyo plant to Shizuoka and to construct a new headquarters building there. Four other plant relocations are planned, including its Hachioji facility.

Oki boosted spending on research and development 38% to ¥35.5 billion ($277.2 million), which included its ongoing participation in national projects involving advanced technology. These include the Fifth-Generation Computer Project, high-speed logic and three-dimensional ICs, operation-specific robots, data bases that can be accessed by different types of computers and optical and electronic ICs.

Telecommunications R&D focuses on digital communications in preparation for ISDN. In electronic devices, Oki developed an ultralow-noise high-electron mobility transistor (HEMT) that reduces noise in satellite communications by 50%.

In information processing, the company's emphasis on integration is seen in such products as the OKITAC 8300 integrated office processor and the ifCOM-11 PC/telephone/communications workstation. Oki now offers 24 × 24 dot matrix printers that are among the fastest made in Japan. Other new systems include a Japanese-English translation system capable of scanning handwritten and printed documents and an integrated mobile communications system incorporating a G3 facsimile transceiver, computer terminal and hands-free telephone.

For Oki's U.S. printer subsidiary, Okidata, 1988 was a history-making year in terms of printers sold and profitability. The nine-pin Microline 320 and the 24-pin Microline 390 and 393 dot matrix units were the biggest sellers. Okidata says many of its dot matrix printer sales came from being a top supplier to value-added resellers in the financial services, medical and manufacturing markets.

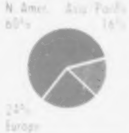
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

Striking Gold With Workstations

Commercial users join techies as aggressive pricing and high performance help Sun keep shining.

37
Total DP Revenues 1,461.6

SUN MICROSYSTEMS INC.
2550 Garcia Avenue
Mountain View, CA 94043
(415) 960-1300



MINI	1,096.2
PERIPH	146.2
SOFTWARE	73
SERVICES	146.2

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

If and when the day of truly open systems dawns, information technology vendors will find themselves in a new game with a new set of rules. No longer able to charge hefty prices to users who are locked into proprietary hardware and software, vendors will be forced to accelerate innovation and accept lower profit margins if they wish to compete.

At least one vendor seems to be operating as if that new open systems reality were here today. Sun Microsystems Inc. of Mountain View, Calif., has combined a breakneck pace of new product introduction with aggressive pricing, a commitment to open systems and what it calls network computing. The result has been breathtaking growth. In just seven years, Sun has blossomed into a $1.46 billion company and what Dataquest Inc. has called "the star of the show" in the $4.1 billion workstation market.

Scott McNealy, Sun founder and CEO

In 1988 alone, Sun's revenues grew 93.4%, and its profits were up 86.7% to $89.6 million. Dataquest figures that Sun, by the end of 1988, accounted for 28.3% of the worldwide workstation market, up 4.2% over 1987. Sun captured market share from rivals Apollo Computer Inc., which dropped 4% to hold a 13.5% market share, and IBM, which dropped 1.1% to 2.6% of the market. Sun's success helped push Apollo into the waiting arms of Hewlett-Packard Co., which acquired the workstation vendor early this year.

Sun succeeded by breaking down barriers in pricing and performance and by cashing in on demand from technical users and a growing number of commercial users. Unlike many personal computers, Sun's workstations offer multitasking and multiuser support, as well as common file access and high-resolution, high-speed graphics. These features have made Sun a favorite with vast numbers of technical users involved in software engineering and design automation. Those market segments represented 68% of Sun's total users in 1988.

Lately, however, Sun's workstations have also become popular among less technical users, such as securities firms and publishers. "The concept of distributed, network-based computing using workstations and servers has captured the imagination of *Fortune* 2,000 users," says Sun corporate marketing vice president Ed Zander. The desktop revolution that started in the early 1980s with PCs has evolved to demand both the power and open systems approach represented by networked workstations, states Zander.

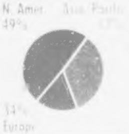
To drive home the point that workstations are the next stop in desktop evolution, Sun has moved aggressively in the past year to increase the power of its workstations, while driving workstation prices down near personal computer levels. Sun, which in 1988 introduced workstations based on its own reduced instruction set microprocessor design, called SPARC, exploited the architecture throughout 1988 and into 1989. In 1988, Sun introduced a low-end, 7-million-instructions-per-second (MIPS) version of its SPARC-based Sun 4 product line with a $19,950 base price. The company followed that early this year with a 12.5-MIPS version having a base price of $8,995. Currently, SPARC-based systems account for about 25% of Sun's unit shipments, which in 1988 amounted to 90,000 workstations.

According to Zander, Sun will continue to place its bets on open systems and aggressive new product and pricing strategies. "We believe in open systems with a fervor," he says. "We understand the model, and we continue to pursue it." In 1988, Sun spent a whopping 13% of its revenues on research and development. Sun executives have said they plan to continue R&D spending at that rate, well above the industry average. At the same time, Sun's aggressive pricing has kept its operating margins low, just over 10%. Many observers expect that to continue, as well. ▭

38
Total DP Revenues
1,424.7

TANDEM COMPUTERS INC.

19333 Vallco Parkway
Cupertino, CA 95014
(408)-725-6000



MAINFRAME 557
DATACOM 140
PERIPH 393.7
SOFTWARE 85
SERVICES 25
MAINT 224

In 1988, Tandem Computers Inc. completed two acquisitions, made nearly a dozen strategic partnerships and found a better way to manage itself. It promoted five executives to senior vice president status and consolidated the far-flung company into five operating groups. The reorganization came in June, at a point when the company was facing a second quarter of profit declines—down 33% from the previous year—as Tandem missed software delivery dates for its fast-selling smaller NonStop computer systems, the CLX.

Tandem, however, recovered in the September and December quarters, to end the year with a $102.1 million profit, virtually unchanged from the prior year's $101.9 million. Revenues, however, soared 30.7% to $1.4 billion, in part reflecting the acquisition of Ungermann-Bass Inc., which added about $140 million to 1988 revenues. Excluding both 1988 acquisitions, Ungermann-Bass and Atalla Corp., Tandem's sales were up approximately 16%.

The flat earnings were due to a change in Tandem's product mix, as the market for its traditional large systems gave way to a demand for its smaller ones, such as the CLX. Because of the acquisitions and the company's determination to maintain a technical lead in the on-line transaction-processing (OLTP) business, research and development spending soared 48.7% last year to $179.6 million.

In May 1988, after taking a small position in Integrated Technology Inc., a Plano, Texas-based telecommunications software company, Tandem bought out 100% of the company and renamed it Tandem Telecommunications Systems Inc. It also completed the merger with Atalla, which is involved in data security products in finance and retail. "We are now a family of companies focused on the evolution of OLTP to the on-line enterprise," said president and chief executive James G. Treybig.

The company has agreements with Apple Computer Inc. and AST Research Inc. to incorporate their personal computers into OLTP networks. Under what it calls its alliance program with other companies, Tandem struck a deal with Motorola Inc.'s Communications Sector to sell a product to utility companies called the Resources Management System, which consists of Tandem NonStop systems and Motorola application products. Tandem also has an agreement with MIPS Computer Systems Inc. to develop extensions to Tandem's UNIX offerings using reduced instruction set computer (RISC) technology. Its Tandem Telecommunications Systems group is working on Integrated Services Digital Network (ISDN) products with AT&T.

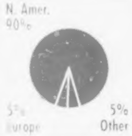
Overseas business suddenly began to shoot up at the end of 1988, accounting for just over half of Tandem's revenues last year. The news inspired financial analysts to raise their expectations for the company's 1989 performance.

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

39
Total DP Revenues
1,356

ZENITH ELECTRONICS CORP.

1000 Milwaukee Avenue
Glenview, IL 60025
(312)-391-7000



MICRO 1,220.4
PERIPH 135.6

Zenith Electronics Corp. went back to what it hopes will be its future in 1988, showing its first profit in three years. The return to profitability was both welcome and well timed, as Zenith had engaged in a year-long cliff-hanger struggle against dissident shareholders eager to see a change in company direction. To avoid the Wall Street raiding party, the company even attempted to sell its hallowed, though unprofitable, television division. In the end, Zenith slipped out of the raiders' grasp just before the final credits rolled at the end of the year.

That episode behind the company, at least for the moment, Zenith officials celebrated its return to the black at the end of the year, a profit of $11.7 million compared with 1987's loss of $19.1 million. Contributing the lion's share of the black ink was the company's computer systems and components division; gravy came from the consumer electronics division, which showed a pretax profit of its own. The computer systems and components division owed much of its 1988 success, as it had many of its past profitable quarters, to the U.S. government, which accounted for more than a third of the company's $1.35 billion in computer and component sales.

Several of the company's major government contracts are ending this year, however, leading Zenith to rely on the retail sales channel for PC sales more than in the past. Through agreements previously made with major computer retail chains, as well as through the company's own Heath/Zenith Computers & Electronics chain, sales of Zenith PCs rose 46% in 1988 from 1987's levels. Despite rapid growth in the retail area, Zenith may see its fastest PC growth occur through original equipment manufacturer (OEM) agreements with other domestic and European companies. In 1988, Zenith signed four multimillion-dollar OEM agreements, including a deal with Hewlett-Packard Co. to market a Zenith laptop computer under HP's label.

Although the company's laptop and portable computers have gotten the most notice, standard IBM-compatible desktop computers account for the majority of PC sales by the company. Most of its new products in 1988 were tweaks and redesigns of earlier systems, but in February 1989 the company introduced its fastest PC, the Z-386/25, based on Intel Corp.'s 80386 microprocessor operating at 25 megahertz. By the end of this year, the company expects to introduce a 32MHz PC, based on the Extended Industry Standard Architecture (EISA).

The company also made a strong move to enter the UNIX and workgroup computing market last year, announcing a multiprocessing technology that uses up to six 80386 chips operating simultaneously. The new family of products will operate UNIX software and will be able to serve as a series of desktop terminals and/or a network of PCs. The first product shipped in February 1989.

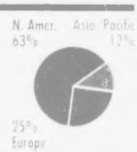
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

Seagate Comes Back From the Brink

A nimble disk drive vendor does some fancy stepping to recover from a forecasting disaster.

40
Total DP Revenues 1,351

SEAGATE TECHNOLOGY
920 Disc Drive
Scotts Valley, CA 95066
(408)-438-6550



At its beginning, 1988 looked like it would be a great year for the disk drive business. Sales of the major players had been soaring, rising 75% or more since 1988. Everybody poured money into more plants and new equipment. But by midyear the picture had changed drastically: the bottom fell out of the market, and the disk drive business had become an easy one in which to look bad. Real bad.

PERIPH
1,351

Seagate Technology Inc., the biggest player in the market, with over a billion dollars in 1987 revenues, had poured $290 million into new facilities, doubled its work force to 30,000 and bought two suppliers. Then in the three months that ended Sept. 30, it reported a staggering pretax loss of $71.3 million ($52.8 million after providing for write-offs).

Alan Shugart, founder and CEO of Seagate

A sudden slowdown in demand forced virtually all disk drive manufacturers to slash production rates as well as prices—a situation that knocked the socks off Seagate, whose strategy has been to produce in high volumes, using low-cost manufacturing methods. Its stock plunged from a high of $23 to $7 per share. A company that had found it difficult to do anything wrong suddenly found itself exemplifying the kinds of strategic blunders that can destroy a company. Seagate chairman Alan Shugart sees no solution to such faulty forecasting. "If I could figure it out, I wouldn't tell anybody. All technology businesses are tough to forecast, whether it's disk drives, or computers, or CRTs or semiconductors. . . . It's been that way my whole life, and it probably was the same with vacuum tubes."

Seagate, which makes rigid disk drives for smaller computers, hadn't fully anticipated the growing demand for newer 3½-inch drives and had continued to gear up for its traditional 5¼-inch products. In a filing with the Securities and Exchange Commission, the company said that if the 3½-inch drive business adversely affected the 5¼-inch market and if Seagate's 3½-inch market weren't as big as the 5¼-inch market, "the company's future financial performance would be seriously impacted."

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

Seagate slashed prices to make up for a serious cash position. For example, at midyear, it cut the price on 85MB 5¼-inch drives to $500 from the $600 to $700 range. The $396 million in cash that it had at the beginning of its fiscal year was down to $93 million by June 30 when its 1988 fiscal year ended.

But Seagate rebounded in the fourth quarter of 1988 to end the year with total revenues of $1.4 billion, somewhat higher than the $1.08 billion mark it set in 1987. Its huge loss of $71.3 million in the quarter that ended in September gave the company an overall 1988 loss of $5.5 million, despite a fourth-quarter profit of $7.6 million. In 1987, Seagate reported a profit of $115.3 million.

Wall Streeters attribute the quick improvement to the fact that Seagate trimmed its inventories by $30 million and launched massive layoffs of nearly 4,000 employees. Its cash at the end of the year doubled to $80 million from its cash on hand at the end of 1987. Most critical to the recovery, though, was the introduction of new 3½-inch drives, at higher per unit prices than its 5¼-inch drives.

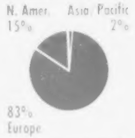
As a result of new 3½-inch drives, the company in the fourth quarter achieved an average price of $246 for its 1.3 million models shipped, including 5¼-inch and 3½-inch designs. This compared favorably with the average price of $234 the company achieved in previous quarter when it shipped 1.2 million units. Part of the shift in product mix included a change in emphasis from the older ST 225 line of 5¼-inch drives to its newer and faster (and higher priced) ST 251 family.

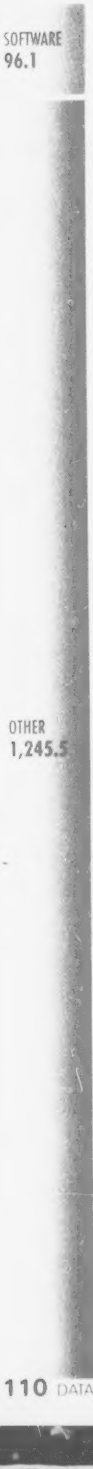
The dramatic turnaround in the quarter that ended in December, followed by a hefty $21.5 million in profits in the first three months of 1989, is a comeback story in an industry where second chances have been rare indeed. ▭

41
Total DP Revenues 1,341.6

ATLANTIC COMPUTERS PLC

Winchmore House
12-15 Fetter Lane
London EC4A 1BR, England
(44-1) 583-9481





Atlantic Computers PLC began 1988 as the only major independent IS leasing firm left in the United Kingdom following a rash of takeovers in the European leasing sector during 1987 by Econocom International BV in the Netherlands and Inspectorate International in Switzerland.

That independent status lasted a mere nine months. In September, the company agreed to a takeover bid by British and Commonwealth Holdings (B&C), a U.K. financial services group. The price was £407 million ($724.2 million). Atlantic had lost credibility over confusion about its financial accounting during the year, and its price per share had dropped drastically.

B&C bought a company that ended the year with revenues up 19.9% to £754 million ($1.3 billion) and profits up 23.3% to £37 million ($65.8 million). But B&C was uncomfortable with Atlantic's attempts at diversification. The Atlantic Network Systems Division, which the company had made bullish predictions for in 1988, saw revenues increase by 60% in the first six months, but still reported a loss over the same period. Atlantic divested the operation late last year to a U.K. firm called Tricom Communications Ltd. The divestiture program continued into 1989 with the recent sale of the MPL power systems division to its management.

Unlike the Atlantic's diversification scheme, B&C was happy about Atlantic's own takeovers during the year. In August 1988, Atlantic announced three European acquisitions for which it paid £11 million ($19.6 million). The acquired companies were ICS in Norway and Denmark, B&B Finanz in Austria and Ljus och Kraft Data/Installation (LOK), a Swedish firm that designs and installs local data communications systems and wiring networks.

In October, Atlantic began an acquisition drive in the United States to build up its North American operations. The first purchase was Datalease, a Westport, Conn., company that had a 1987 turnover of $25 million from leasing IBM midrange System 3Xs. In December, Atlantic shelled out another $20 million for two U.S.-based leasing firms: Princeton Computers in Cranbury, N.J., and GS Computer in Irvine, Calif. During 1988, Princeton had sales of around $70 million and GS had sales of around $30 million.

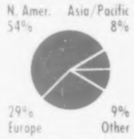
These companies were merged with Atlantic's U.S. operations, which helped to push the share of U.S. revenues up from 5% in 1987 to 15% in 1988. This increase only included three months of Datalease's sales and a month of sales from Princeton and GS, so Atlantic expects another significant boost to its U.S. business when the full year of sales from these operations are included this year. Meanwhile, Atlantic has embarked on a geographic expansion program with new operations in Singapore and New Zealand. More are slated for this year.

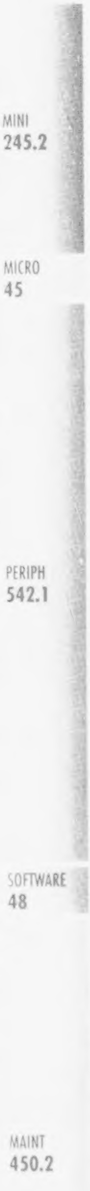
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

42
Total DP Revenues 1,330.5

DATA GENERAL CORP.

4400 Computer Drive
Westborough, MA 01580
(617) 366-8911





In 1988, Data General Corp. was born again. After four years of blaming conservative and cyclical buying trends for weak sales and mounting losses, DG last year conceded that larger forces were at work. It discovered open systems with all the fervor of a sinner redeemed.

Data General turned away from its proprietary past and outlined a new philosophy involving commercially designed microprocessors and the AT&T UNIX operating system. DG's new generation will build on Motorola Inc.'s 88000 reduced instruction set computer (RISC) technology and a version of UNIX tailored to commercial applications. In a move unprecedented in DG's 20-year history, major new systems will no longer provide the software compatibility that helped DG users move from the 16-bit Nova to the 32-bit Eclipse/MV families.

But, for all the change, there was a lot of sameness to the year. As in years past, the losses accompanied yet another bout of firings and plant consolidations. Moreover, the RISC/UNIX family will continue some traditions. Historically, the company responds to bad times by leapfrogging competitors with more powerful and less expensive processors. This time, the plan involves designing a faster version of the 88000. With first access to systems incorporating the faster chip, the company hopes it can deliver better price/performance than other Motorola RISC computer suppliers. While some RISC/UNIX systems are expected in the first half of 1989, those incorporating the DG-designed processor won't be available in large numbers until 1990.

As it hits the open systems road, DG does not wish to neglect users of the proprietary Eclipse/MV family. Newer Eclipse/MV computers, it promises, will sustain users and the company until the RISC systems arrive. Underscoring that promise was the debut of a low-cost MV/2500, which preceded the fall unveiling of a top-of-the-line MV/40000, in uniprocessor to quadratic versions.

Still, the delay between the MV/40000's fall unveiling and volume shipments stalled the purchase plans of enough Eclipse/MV loyalists to crimp sales for the calendar year and spill more red ink. At year's end, revenues totaled $1.3 billion, barely higher than the prior year's figures or those of the year before that. Losses—primarily from charges associated with a new round of plant closings—reached $48.9 million, less than half of 1987's $111 million loss.

A rising proportion of the company's sales are being made outside the United States. All its revenue growth last year occurred in Japan and Europe. Sales outside the States climbed 12% to $612 million from 1987's $547.6 million. While largely the result of a weak U.S. dollar, the sharp increase put DG's non-U.S. revenues—46% of its total—within ambition's distance of home market revenues.

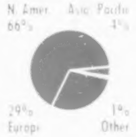
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

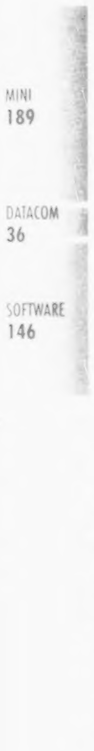
43

Total DP Revenues 1,289

MCDONNELL DOUGLAS CORP.

P.O. Box 516
St. Louis, MO 63166
(314) 232-0232





In a year when it expected to rejoin the ranks of the living, McDonnell Douglas Information Systems Co. (MDISC) bombed. It lost $76 million, a hefty 81% increase over the previous year's $42 million bummer. MDISC admitted in its annual report that "each of the [IS] segment's major lines of business performed below expectations, with the exception of Network Systems."

However, confessions don't cut it at the bottom line. MDISC hasn't had a profitable year since its birth in 1984, and 1988 was its second-worst year. Already in a bath of red ink, how will the company prevent a hemorrhage?

"Our expectations far exceeded reality last year," says Gareth Chang, MDISC's senior vice president of marketing and planning. "We overestimated ourselves. It was a very sobering experience. We're far more realistic this year."

And the company is far smaller as well. MDISC decided it was trying to compete in too many parts of the computer information services market and that it had been too optimistic in most of its forecasts and planning assumptions. Facing the music, MDISC cut 600 of its 11,000 employees last fall. It also sold Vitek Systems Inc., a health-related business, as well as its interest in a health maintenance organization. MDISC's third health-related company was expected to be sold in the first half of 1989. MDISC also kissed off direct sales of computer systems in North America.

That left Network Systems, Systems Integration and Computer Applications as the company's raison d'être. But, if a turnaround is going to happen, such a triumvirate is not all that unstable a foundation.

Network Systems, based on Tymnet, is the second-largest data transmission network in the United States and one of the largest internationally. Tymnet added 40 U.S. cities to its network last year, bringing the total number of cities served to 800. MDISC also added Network Applications Services to Network Systems as the first step in turning Tymnet into an international platform for value-added services. Systems Integration was restructured from several disparate units into four closely related pieces. MDISC won two state government contracts: one from Massachusetts as the primary systems integration vendor for all state environmental regulatory agencies, and one from Pennsylvania's Department of Environmental Services. Computer Applications played a significant part in MDISC's 18% increase in international revenues.

"Our agenda's narrowed and it's very clear," Chang says. "We've focused down to a few niches we can be successful in. We've removed the myth from systems integration forecasts, for example. We know we're not going to have 35% more revenue than the previous year; 15 to 17% is much more realistic. It brings us more valued added, too."

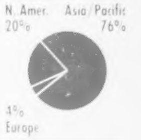
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

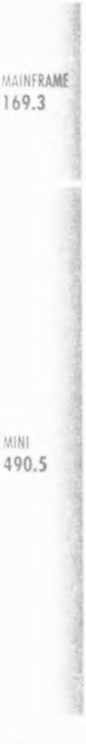
44

Total DP Revenues 1,270.7

MITSUBISHI ELECTRIC CORP.

2-3 Marunouchi 2-chome
Chiyoda-ku, Tokyo 100, Japan
(81-3) 218-2111





In 1988, Mitsubishi Electric Corp. took steps to offset the appreciation of the yen. It streamlined operations and product development, reformulated business strategies along more aggressive lines and established a global satellite network for manufacturing, sales and parts procurement.

The digital network is called MIND. It was installed to connect Mitsubishi and its 2,300 domestic subsidiaries, affiliates and sales centers, and will eventually link all Mitsubishi locations.

Mitsubishi's IS sales were up 7.5% to ¥162.8 billion ($1.3 billion), while net income was up 107.1% to ¥39.3 billion ($307 million). Mitsubishi's information-processing systems range from PCs to general purpose mainframes. The firm's mainframe computer business, however, has not been as successful as had been hoped, owing largely to inadequate applications and operating system software. Sales of U.S.-made Mitsubishi PCs began last year.

Also in 1988, Mitsubishi introduced its Intel Corp. microprocessor-based 32-bit M3300 series workstation and the Melcom PSI-II. An upgraded version of its Melcom PSI, the PSI-II is Japan's first AI workstation, a product of the government-sponsored Fifth-Generation Computer Project. Improvements in disk drives continued, and innovations in peripherals included high-resolution color monitors, high-speed thermal transfer color printers and a high-capacity memory card.

On January 1, 1989, Mitsubishi established Mitsubishi Electric France SA, a new $3 million wholly owned subsidiary headquartered in Paris. Its first product, which will be manufactured in Etrelles, will be cellular mobile telephones.

In December, the company announced the successful development of what it billed as the world's first optical "neurochip." The prototype device, which will be the basis for what the company calls an "associative optical neurocomputer," has a three-dimensional design and can be installed on a single board, together with existing large-scale integration (LSI) chips. On the more conventional semiconductor front, Mitsubishi, along with NEC Corp. and Toshiba Corp., announced in February the development of a 16-megabit dynamic random access memory (DRAM) chip. Yamaichi Securities Co. Ltd. reports that a 46% increase in integrated circuit sales was responsible for a 22.7% rise in sales for Mitsubishi's data communications/electronic device division.

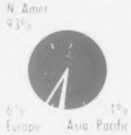
A December report from Yamaichi also predicts that Mitsubishi will benefit the most from the Japan Defense Agency's expanding budget. Yamaichi says the Mitubishi's growth in this area will outpace its competitors because of its leading position as a defense contractor and because of new products, such as a radar system that could be adopted for the FSX fighter aircraft.

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

45
Total DP Revenues 1,253.4

COMPUTER SCIENCES CORP.

2100 East Grand Avenue
El Segundo, CA 90245
(213) 615-0311



In its second year as a billion-dollar company, Computer Sciences Corp. was moving "according to plan," as chairman and president William R. Hoover put it in the annual report. An important element of that plan is to boost CSC's market share of professional services to commercial customers. A dominant provider of systems and services to the federal government, CSC reported hefty 1988 federal revenues of $817.4 million, a 15% increase over 1987. But it was in nonfederal professional services that it grew the fastest last year—revenues increasing 24% to $135.4 million, compared with $108.8 million the year before.

Total revenues of $1.25 billion rose 10.5% over 1987's $1.13 billion, and earnings soared 22% to $49.5 million from $40.5 million the year before.

To shore up its commercial Professional Services operations, CSC last year acquired Index Group Inc., a Cambridge, Mass.-based consulting firm that helps large companies plan strategy and offers educational and research services focused on the uses of information technology. In 1986, CSC had acquired Computer Partners Inc., which immediately formed a systems integration group. Computer Partners and Index will lead CSC to commercial jobs with the help of CSC's existing Systems Group, which does systems integration for the federal government. The Systems Group will also provide the other two commercial units with project management and communications services. The commercial part of the systems integration market is estimated to be growing twice as fast as the federal part, and CSC wants it to account for half of the company's operating profits.

SERVICES
1,253.4

The company also operates a credit-reporting system, which last year accounted for $106.8 million in revenues, up 6% from 1987. Complementary services, including a computer-integrated manufacturing (CIM) system called MANFACT II and a tax preparation service, accounted for $26.3 million, up 2%. Health and insurance systems dropped 23% to $83.7 million after the company lost the state of California health insurance program, and revenues from its Network Services subsidiary, Infonet, rose 2% to $83.8.

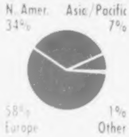
Infonet, an international packet-switch network serving 31 countries, was partially spun off to a combination of French, German, Scandinavian and Spanish PTTs (postal, telephone and telegraph administrations), which use Infonet to link their public data networks.

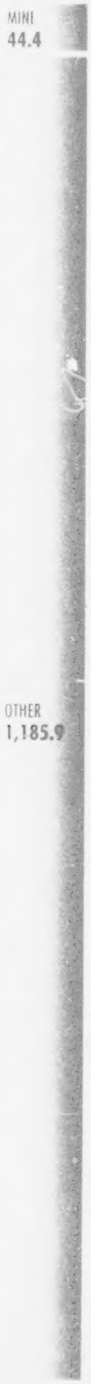
CSC plans to spin off more of Infonet this year, eventually retaining a 30% interest. Chairman Hoover says the move was a chance to form a closer relationship with these PTTs and to "position Infonet to capitalize on telecommunication interconnection requirements in Europe's 1992 transition into a common market."

46
Total DP Revenues 1,230.3

INSPECTORATE INTERNATIONAL LTD.

Case Postale 63
3000 Berne 63, Switzerland
(41-31) 46-21-61





This fast-growing European IS-leasing company was created within a few years by financier Werner K. Rey through a series of takeovers on both sides of the Atlantic.

Inspectorate International Ltd. began as an inspection and quality control business, providing inspectors to firms trading in commodities. Rey branched out and acquired a cluster of computer-leasing and service companies that have transformed it into a strong IS company. In computer leasing, the company is number 1 in Europe and now number 2 in the United States. It is also engaged in software development and systems engineering at home in Switzerland.

Last year was one of consolidation for the company, as it digested the major British acquisitions of 1987 (IBL and United Leasing PLC) and merged them with its existing operations. The company's 1988 revenues, at SFr2.47 billion ($1.7 billion) were almost exactly the same as those for 1987, while IS revenues were down slightly to SFr1.8 billion ($1.2 billion), representing nearly 73% of the company's total. Earnings before taxes and interest amounted to SFr193 million ($132 million), of which IS activities generated SFr84 million ($57.4 million).

The company's diversification began with the acquisition of the U.S. leasing firm, The Meridian Group, and was followed by the 1987 takeover of two British companies. One of them, United Leasing, owned Unilease, the third-largest leasing company in the United States. The process of merging the new subsidiaries with the company's existing IS operations called for substantial restructuring, resulting in the virtual halving of the work force. Inspectorate's leasing operations are now centered in two major regional organizations: The Meridian Group, based in Deerfield, Ill., and Meridian International, which is based outside London.

The revenues of the European operation totaled £480 million ($854 million) in 1988, with pretax earnings amounting to £16.4 million ($29.2 million). That was a higher rate of profitability than expected, considering the costs of restructuring. The company is also looking for substantially higher DP earnings in 1989.

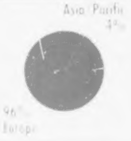
Meridian traditionally specializes in IBM systems, but is now expanding into the market for Digital hardware, with the expectation that Digital will account for a growing share of the computer-leasing market in the coming years. In 1988, Meridian took over another British firm, London-based Electronic Brokers, which is a specialist in Digital leasing.

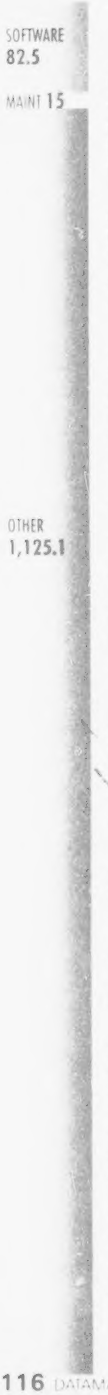
Most of the acquisitions drive is now over, according to Meridian's European management, and 1989 will be a year of building market share. But, if the right company comes along, Rey will still be there with a fistful of Swiss francs to add it to his rapidly growing IS portfolio.

47
Total DP Revenues
1,222.6

SOCIETE GENERALE

Boulevard Haussmann
75009 Paris, France
(33-1) 40-98-20-00





France's largest private sector bank, Société Générale, has two major IS subsidiaries—leasing firm Europe Computer Systèmes (ECS) and services company SG2. Together, these subsidiaries achieved a healthy 30% growth in revenues in 1988, with combined revenues of FF7.572 billion ($1.269 billion), compared with FF5.829 billion ($977 million) the year before.

Much of this growth came from the ECS leasing operations, which contributed FF6.8 billion ($1.1 billion) to total revenues—a 24% increase over 1987. Meanwhile, SG2 recorded a modest 7.3% advance to FF781 million ($131 million) from FF728 million ($121.2 million) in 1987.

The buoyant performance of ECS can be attributed in large measure to the decision taken in 1985 to expand into foreign markets. After establishing subsidiaries in Belgium, Britain, Italy, Japan and West Germany in 1986 and 1987, ECS moved into Spain and Switzerland in 1988. Altogether, it now operates 25 branches abroad and 29 in France.

ECS specializes in leasing IBM mainframe and minicomputer systems and, since 1984, PC-level machines from COMPAQ Computer Corp., Groupe Bull and Toshiba Corp. The firm's PC subsidiary, ECS Diffusion, boosted revenues by 70% in 1988, although at FF191 million ($32 million), it still remains a relatively small operation in the ECS hierarchy. ECS also has a maintenance company, ECS Maintenance, and a training subsidiary, ECS Bureautique.

The ECS group diversified its activities further in 1988 by setting up a joint financial subsidiary called Financière ECS-FIP, in conjunction with a local finance house, to finance leasing for central and local government.

As for the services subsidiary SG2, it has now overcome the turmoil of the mid-1980s, when revenues peaked, profits dived and a strategy of staff cutbacks and restructuring was introduced. Albeit from a smaller base, SG2 is now more profitable than ECS, and although both companies more than doubled their net earnings in 1988, ECS still made only FF49 million ($8.2 million), while SG2's earnings of FF32.4 million ($5.4 million) were 4.1% of revenues, up from 1.75% in 1987.

Like Sligos, the other leading French service company spawned by a big bank, SG2 specializes in banking and financial applications, which account for 60% of its business. SG2 derives 27% of its revenues from its parent company and concentrates its activities in the French market, having established a foreign presence only in Britain, Italy and Spain which together contributed 6% of revenues in 1988.

This year, SG2 intends to focus increasing attention on industrial, technical and scientific systems, which currently represent 1% of revenues. It plans to expand its activities in this field by taking over small specialist firms in Europe.

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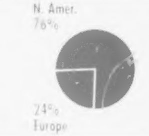
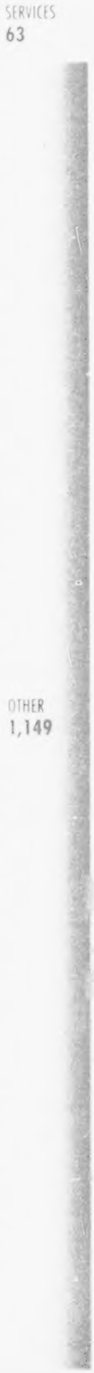
48
Total DP Revenues
1,212

COMDISCO INC.

6111 North River Road
Rosemont, IL 60018
(312) 698-3000





For those concerned with the image of the computer-leasing business, 1988 was a year best forgotten. Writedowns, bankruptcies and low-ball pricing were the order of the day. First, two big leasing companies, both headed by former presidents of the Computer Dealers and Lessors Association, went bankrupt—not the sort of thing that inspires confidence in a poorly understood business. Then came the news that IBM Credit Corp., Big Blue's financing arm, took a $25 million write-down on equipment residual values, confirming to many that IBM spent 1988 buying market share at the expense of profit margins.

At Comdisco, the largest independent lessor, revenues from computer leasing and remarketing rose a paltry 3.5% to $1.15 billion in 1988. What growth Comdisco did see was in strong sales of used equipment and in the leasing of non-IBM computers and data communications equipment. Non-IBM leasing accounted for 50% of Comdisco's leasing business in 1988, up from 40% in 1987. In the years to come, Comdisco executives believe the non-IBM part of the business might become the most profitable.

To counter the tight market at home, Comdisco has devoted more resources to its international business. While European business grew substantially in 1987, it was a different, slower story last year. Revenues for Comdisco's fiscal year ending in September were up only 5% to $215 million in Europe, while losses more than doubled to $11.8 million. Comdisco doesn't expect to see much improvement for at least another year.

The one bright spot is Comdisco Disaster Recovery Services, which continues to see strong growth. Revenues rose more than 45% to $63 million in 1988, and Comdisco added new recovery centers in Canada and the United Kingdom. IBM has announced it will enter the disaster recovery business, and Comdisco is upbeat about IBM's entry, saying the oft-rumored move will help Comdisco's disaster recovery revenues: once again, IBM legitimizes a market just by entering it.

Comdisco's 46.5% increase in the disaster recovery business helped boost its overall IS growth 5.4% to $1.2 billion. Total sales at the company were $1.4 billion with earnings of $96 million, up substantially over 1987 when the stock market crash devastated its risk arbitrage unit. Perhaps wisely, Comdisco is no longer in the equity business.

Comdisco describes itself as a service company, one that goes beyond mere equipment brokering. Comdisco claims it actually helps clients deal with the changing face of information technology. To live up to that ambition, in 1988 it beefed up its marketing force, adding nearly 400 employees, a 33% increase in its work force. Selling, general and administrative expenses increased nearly 30%, despite the relatively flat growth in revenues.

[illegible]

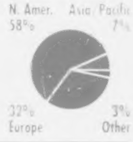
SOFTWARE
40

A Consulting Giant Bets on SI

Despite internal troubles, Arthur Andersen's consulting business has doubled in two years.

49
Total DP Revenues 1.198.5

ARTHUR ANDERSEN & CO.
69 West Washington Street
Chicago, IL 60602
(312) 580-0069



SERVICES
1,158.5

The juggernaut of systems integration (SI) forges ahead, and SI giant Arthur Andersen & Co. says you either drive or you get left behind. Andersen doesn't intend to get left behind.

In a year when overall company revenue increased 20% and almost reached $3 billion, Andersen's IS-related take was up 60% over 1987, hurdling projections to just under $1.2 billion, double the business only two years ago. After a tumultuous year of defections, acquisitions and reorganizations, Andersen sees the rapidly crystallizing systems integration market as the place where it will make its bid for supremacy against fewer and fiercer competitors.

Mel Bergstein, tech czar at Andersen

"Clearly," says John Altman, Andersen's director of worldwide SI practice, "we believe that this is a marketplace that is going to consolidate. Over the next several years, there are going to be very few survivors." Altman, who is also managing partner of the firm's Chicago consulting operations, says "Effective service firms will have to look at their structures to be as effective as we are. We have made the tough decisions, and we're ready now to meet the challenges."

Those tough decisions were made, however, in the face of problems that in 1988 raised doubts about Andersen's long-term viability. As information consulting grew throughout the Big Eight accountancies, consultants became angry at their proportionally diminishing share of profits in key operating decisions. When key partners began leaving to start up rival consultancies, the industry watched for Andersen's reaction. It was swift. The firm split its practice into a tax/audit unit and Andersen Consulting and tied partners' compensation to profitability. That took power away from many top regional managers and left some bad blood between the financial and information sides. But considering revenues of $80,000 per consulting employee and $53,000 per tax/audit employee, there was little else that Andersen could do.

The lure of defection remains, of course. Gresham Brebach, then Andersen's head of domestic consulting operations, was fired in April 1988 for planning to start a rival firm. With several former colleagues, he formed the Information Consulting Group Inc. Altman says such defections will not hurt Andersen. "We haven't had more leave this year than in any previous year," he states.

Mel Bergstein, managing partner for technical competence, adds, "We have a tremendous talent pool that has been built up over decades. We have aggregate experience with jobs in dozens of industries over decades."

The company will turn these resources toward a market that is shaking out some hefty competition. Systems integration—providing for a client's total systems needs, from sourcing hardware to writing software—is seen as the marketing wedge of the future: Digital and IBM are systems integrators. Altman is positive about the development: "What they did added legitimacy to the market." Bergstein, noting that IBM is Andersen's largest consulting client, says, "We would prefer not to compete with IBM. But if we have to, we will."

Such confidence is founded on investment. Bergstein, who oversees R&D activities, the software product business and consultant training, notes that Andersen Consulting nearly doubled its R&D investment to $300 million: $125 million went toward employee education (a whopping $8,000 per person), $100 million to software development, a 50% increase over the previous year, over half of that going to CASE. Bergstein cites two reasons for the big CASE commitment: "Our biggest fear is the combined product and services company. So it's a competitive issue. The second issue is that our clients want standard environments that they can use across their company." He expects 1988's software revenue of $40 million to triple in 1989. ▭

50
Total DP Revenues 1,165.1

NOKIA CORP.

P.O. Box 226
00101 Helsinki
Finland
(358-0) 10711

MAINFRAME	19.1
MINI	65.7
MICRO	337.8
DATACOM	58.1
PERIPH	298.6
SOFTWARE	59.7
SERVICES	35.8
MAINT	167.2
OTHER	123.1

It takes a lot to turn a sluggish Swedish data systems division and a fast-growing Finnish IS subsidiary into a single, vibrant and efficient European company. Kalle Isokallio, the brusque and ambitious president of Nokia Data spent 1988 trying to do just that. But he underestimated the problems and only partially succeeded. "I feel I had a too optimistic and aggressive time scale," he says. "That's only natural."

Nokia Data is the result of a merger between the Data Division of Ericsson Information Systems, a subsidiary of major Scandinavian telecommunications company LM Ericsson, and the IS sales operations of Finnish industrial conglomerate Nokia. Ericsson maintains a 20% stake but Nokia is boss.

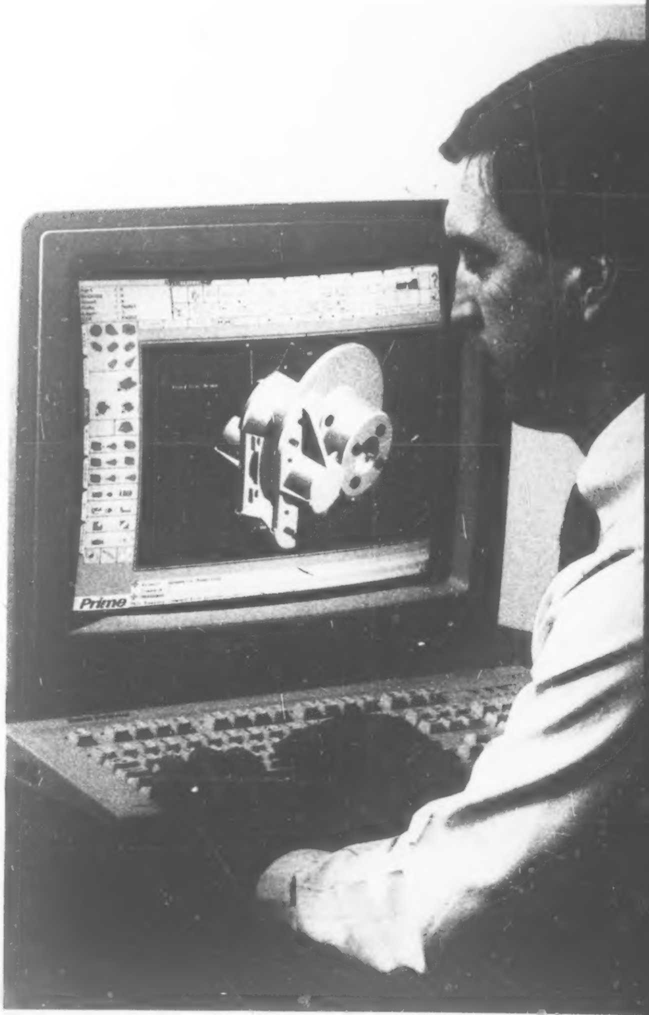
The merger catapulted Nokia Data's IS revenues up 166% to FIM4.9 billion ($1.2 billion). Pretax profits for the Nokia group, however, slumped 11.3% to FIM1.1 billion ($259.7 million) on revenues that had risen 55.8% to FIM22 billion ($5.2 billion). Restructuring Nokia Data took its toll on group profitability.

The firm also suffered from only half the growth rates it had hoped for. "We were looking for 7% and got 3 to 4%," says Isokallio. The new Nokia Data sells primarily terminals, PCs, workstations and workgroup systems. Over 700,000 (broadly defined) professional workstations have been installed. Digital and IBM buy its terminals and monitors for sale in European markets. In Finland it also distributes DPS 8 and DPS 6 systems from France's Groupe Bull, Tandem fault-tolerant machines and some IBM plug-compatible mainframes from National Advanced Systems Corp.

Nokia Data's customer base is predominantly in the banking, insurance, retail and public administration sectors. The West German Bundespost and the Midland Bank in the United Kingdom are among its major customers outside Scandinavia. "One of the reasons we bought the Ericsson operations was for customer base," explains Isokallio. "It can take three to five years just to build a sales network. You'll see a lot more of this. U.S. companies particularly will be buying European companies for their customer base."

Nokia's product development is driven by a combination of networking and ergonomics. These, believes Isokallio, are the keys to IS in the 1990s. "From a users point of view, it is not an OS/2 world or a UNIX world, it's a local area network world," says Isokallio. "We are creating systems that increase the usability of these networks by, for example, connecting UNIX and OS/2 environments. We want to get deeper into the usability of terminal and workstation systems—not just radiation emission levels and physical or software ergonomics—but into the way the systems are used by people. That's what is going to make us different."

Mergers and acquisitions were plentiful in 1988, notably Prime's purchase of Computervision. But the trend among big companies in 1989 may be to take equity stakes in small-frys.



C. ITOH & CO. LTD.

5-1, Kita-Aoyama 2-chome
Minato-ku, Tokyo 107 Japan
(81-3)-497-4141

51 Although C. Itoh & Co. Inc.'s overall revenues dipped slightly last year, this international trading company's IS operations climbed an estimated 15%, rebounding from a decline in the previous year. Nevertheless, despite the growth, IS continues to account for less than 1% of the company's total business.

Last year's IS revenue increase is encouraging C. Itoh to move more aggressively into information systems and telecommunications, despite lacking its own research and development facilities. As a trading company, C. Itoh primarily sells products manufactured by other companies, such as Tokyo Electron Ltd., which manufactores printers sold under the C. Itoh name. C. Itoh's computer family includes fault tolerant computers manufactured by Stratus Computer Inc. and workstations from Sun Microsystems Inc.

As part of its IS expansion, C. Itoh and Nippon Steel jointly established NCI Systems Integration Inc. in April. The venture offers comprehensive programs for planning, constructing, integrating and managing advanced large-scale information-processing systems for domestic Japanese and overseas companies.

NCI sells customized and packaged software, computer hardware and other information processing and telecommunications equipment. Like other systems integrators, such as CSK Group, Computer Sciences Corp. and Electronic Data Systems Corp., NCI claims its consulting and planning services are free from questionable relationships with computer vendors and software companies.

NATIONAL SEMICONDUCTOR CORP.

2900 Semiconductor Drive
Santa Clara, CA 95052
(408)-721-5000

52 A year ago, the DATAMATION 100 reported that National Semiconductor Corp. was flying high. In 1987, bolstered by a broad recovery in semiconductor markets and continued strong demand for its IBM-compatible line of mainframe computers and peripherals, National Semiconductor Corp. had recorded its first profit in over two years.

In 1988, however, National returned to its money-losing ways. Chip bookings were off, the result of another semiconductor market slump, which in part was attributed to softening demand from makers of desktop computer systems.

And this time, the company's National Advanced Systems plug-compatible manufacturer (PCM) systems unit could not offset semiconductor losses. Plagued by product shortages, an unfavorable product cycle period and strong competition from IBM and Amdahl Corp., NAS slumped right along with National's semiconductor business. The result was a company-wide loss of $18.1 million for the year and a decision by National Semiconductor president and chief executive officer Charles E. Spork to get out of the computer business by selling off both NAS and the Datachecker point-of-sale systems division. Those two businesses, which made up the Information Systems Group, had accounted for much of National Semiconductor's revenue growth in recent years. In 1988, the group accounted for just over $1 billion, 38% of the parent company's $2.7 billion in revenue.

Acer's November 1988 stock flotation was the most popular in the history of the Taiwanese stock exchange; it was oversubscribed 118 times.

After false alarms about a sale to Memorex Telex N.V., National sold NAS to a joint venture of Hitachi Corp. and General Motors Corp.'s unit, Electronic Data Systems Corp. for $398 million in cash. Hitachi/EDS then turned around and said it would sell the European portion of NAS to Comparex Information Systems GmbH, the Mannheim, West Germany, PCM distributor.

CAP GEMINI SOGETI

11 rue de Tilsitt
75017 Paris, France
(33-1)-47-54-50-00

53 Nineteen eighty-eight was Cap Gemini Sogeti's (CGS) first full year after taking control of another large French services company, Société d'Études des Systèmes d'Automation (SESA). The merger resulted in a 39% advance in revenues from 1987, up to FF581.6 billion ($975 million), and a 43.6% surge in net earnings to FF402 million ($67.4 million). Net margins improved from 6.7% to a record 6.9%.

At home, the company devoted its energies to merging the two local operations into Cap SESA, which officially came into existence on January 1, 1989. It is by far the biggest in the CGS group, comprising 17 separate companies and employing 5,000 people. Cap SESA generated revenues of FF2.6 billion ($435.9 million) in 1988, accounting for 46% of the company's total revenues. Other European countries contributed 36%, and the United States provided 18%. CGS claims a services sector market share of about 12% in France and 6.5% elsewhere in Europe. In the United States, revenue was up over 20%, and the group is intent on expanding its 1% share of the U.S. market through further acquisitions.

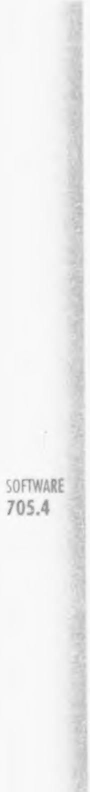
CGS made several takeovers in Europe in 1988, especially in Scandinavia. It paid about FF250 million (around $42 million) for the Swedish service company, Data Logic AB, and bought the small services firm, Hiekkamaki, in Finland.

Elsewhere in Europe, CGS consolidated its operations in Italy and West Germany. The company tried to expand and diversify its British subsidiary beyond the highly specialized sphere of command-and-control systems by buying into Britain's CAP Group early in the year. That attempt failed and, afterwards, CAP merged with France's Sema Metra. However, CGS kept on buying and by the end of the year had built up a 22% stake in the new Sema Group PLC.

And the buying spree isn't over yet. CGS has topped the list of European service companies for many years and is determined to hold onto that position through as many acquisitions as necessary. Meanwhile, the smaller firms are regrouping in preparation for Europe's single market in 1992.

CA Buys Into The Big Time

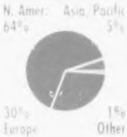
In a year marked by heated mergers and acquisitions in the industry, Computer Associates says internal strengths fueled its real growth.



REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

55
Total DP Revenues 925.3

COMPUTER ASSOCIATES INTERNATIONAL INC.
711 Stewart Avenue
Garden City, NY 11530
(516)-227-3300



Mention mergers and acquisitions to a computer maven, and, doubtless, one of the first names to be spoken will be that of Charles Wang, chairman and CEO of Computer Associates International Inc. Wang has built what some call the "IBM of the software industry" into a marketing behemoth with 1988 revenues of $925.3 million. In 1989, the company should easily soar through the billion-dollar barrier.

Wang built Computer Associates in a very eighties way: he shopped. Since 1986, almost 30 independent software vendors have vanished into CA's carry-all. Among these acquisitions have been such well-known brands as ADR, Integrated Software Systems Inc., Software International Inc., Sorcim and UCCEL Inc. Sanjay Kumar, Computer Associates' senior vice president of planning, says the company's average customer has four CA products, and the average IBM 3090E shop with which it deals has 20 CA products. Given that CA customers number about 30,000—out of the 35,000 to 40,000 IBM mainframe sites worldwide—this, indeed, is market penetration.

In 1988, CA bought the mainframe software vendor ADR, solidifying its position in the data base management system and program-producing market. And even though, Kumar says, CA already owned about two-thirds of the mainframe security market, with two of the three top-selling packages, Top Secret and ACF-2, the company sought a lock on the sector by acquiring Omni-Guard from On-Line Software. In a private deal for a private company—Atrium Interactive Systems of Fairfield, Iowa—CA got Micro Resource Manager for PCs and a problem management/change management product for the Digital VAX. The latter product gives Computer Associates a one-two application punch, joining the firm's existing Netman for the IBM world.

Broadening the world of architectures on which its products can run is a basic piece of Computer Associates' strategy. Wang recently told DATAMATION that software companies, in order to maintain their independence, must provide interfaces and programs that "bridge all the multiple hardware platforms." CA took the first step toward building this bridge in February of 1989, when it announced the CA Application Construction Environment (CAACE), described by the company as a "comprehensive software architecture that provides a framework for application development in the 1990s." The introduction of CAACE has calmed some fears among CA customers through one of its guiding principles, a relational DBMS architecture based on SQL. Other CAACE aims are operating transparency for VSAM, IMS and Total; across IBM mainframes under MVS, VM and VSE; across PCs under DOS and OS/2; and across VMS and UNIX.

Charles Wang, CEO of Computer Associates

To fund developments like CAACE, CA spent $110 million on research and development in 1988. This amounted to nearly 12% of revenues, well above the industry average, which many place at about 7% of revenues. Obviously, Wang's claim that CA has taken a bad rap for stinting on R&D spending is supported by the numbers.

According to Kumar, the public perception that Computer Associates has grown only through acquisitions is also misleading: "Growth without acquisition would have been 30%." Still, the company's growth with acquisition is even more impressive: 1988 revenues were 42.6% higher than 1987's results. Profits were up 136.5% to $142.4 million, proof enough of smart shopping linked with wise marketing.

Nevertheless, not all is smooth in Computer Associates' world. Some customers—particularly users of the ADR linchpin DBMS, now named CA-Datacom/DB—hope that CA's strategies won't derail their own plans, based on longtime, solid relationships with ADR sales and development teams. ▭

COMMODORE
INTERNATIONAL LTD.
1200 Wilson Drive
West Chester, PA 19380
(215)-431-9100

54 Commodore International Ltd. has some peculiar similarities with its better known rival, Apple Computer Inc. Like the Apple II, the Commodore 64 has remained popular years after technology has superseded it. Like the Macintosh, the Commodore Amiga is distinguished by its graphics. Finally, like Apple, Commodore turned to the soft drink industry, specifically PepsiCo Inc., to recruit executive talent with consumer marketing savvy.

But there the similarities end. The Amiga, while widely respected, has been very slow to gather sales momentum. Only now, four years after its first introduction, is it beginning to surpass the sales of the Commodore 64/128 family. And Thomas Rattigan, the former PepsiCo executive who joined Commodore in 1986, lasted only a year. And unlike Apple, which is a PC power because of its sales in its home market, Commodore is almost a nonentity in the United States. With nearly three-fourths of its sales outside the United States, Commodore actually is the most international of any U.S.-based company on the DATAMATION 100 list.

Commodore is a clear leader in the German market and a major factor in Austria, Belgium, Sweden and the Netherlands. Only in Britain and France is it weak. Altogether, Europe accounts for 67% of the company's $926.1 million in PC-related sales, which were up 18% over 1987's levels. The United States accounts for just over one-fourth of Commodore's sales, with Australia and the Far East accounting for the rest. In addition to the Amiga and the 64/128 computers, Commodore offers a line of MS-DOS PCs.

Although the Amiga has struggled to gain credibility in the marketplace, its popularity is increasing, thanks to the growing availability of software. Commodore has Amiga models that appeal to the home and small-business market, as well as to sophisticated users of desktop publishing and animation applications. This year, Commodore plans to announce a 32-bit version of the Amiga with software designed for the German biomedical molecular simulation market.

NORTHERN TELECOM LTD.
3 Robert Speck Parkway,
Mississauga, Canada L4Z 3C8
(416)-897-9000

56 When Northern Telecom Ltd. called 1988 a year of "repositioning," it was describing its decision to take a $200 million write-off for restructuring and setting its new focus on international markets. But the most telling repositioning took place this March in Northern Telecom's executive suite. Paul G. Stern, ex-president of Burroughs Corp. and number 3 man at Unisys Corp. until his abrupt departure in 1987, replaced Edmund B. Fitzgerald as chief executive officer. Recruiting a corporate outsider from the United States whose background is in computers to head an entrenched Canadian telecom company says a lot about Northern Telecom's corporate compass.

Stern inherits a company that has struggled to maintain its presence in the PBX market, but unlike others (notably IBM and Siemens AG), Northern Telecom has managed to be profitable at it. The company's basic strategy has been to position itself as the telecommunications vendor that will work with anyone's equipment. To that end, it has struck alliances with several leading computer manufacturers, most significantly Digital, supporting that company's computer-integrated telephony.

Northern Telecom's $200 million reorganization, which produced a $17.5 million loss in its fourth quarter, closed several plants in Canada and the United States. According to the company, this restructuring reflects the shift in the company's products from hardware to software and its ability to source components from reliable offshore manufacturers. For the year, Northern Telecom reported revenues of $5.1 billion and earnings of $165.6 million. DATAMATION estimates that sales of PBXs, packet-switching equipment and other systems amounted to $900 million. Although sales remained the same as 1987 levels, that's partly a reflection of declining prices and Northern Telecom's sale of its small European data systems group to STC PLC.

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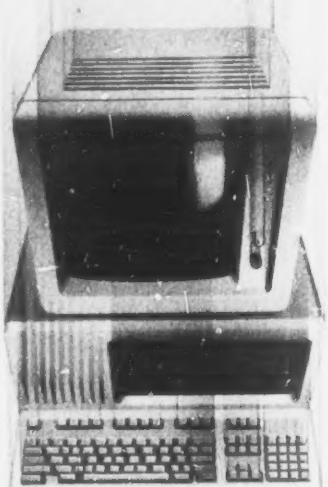

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COMPANY PROFILES

ECONOCOM INTERNATIONAL BV
1105-BH
Amsterdam Z.0. the Netherlands
(31-20)-97-27-21

57 Fierce competition and the announcement of IBM's AS/400 chopped Econocom International BV's profits back 39% to F20.4 million ($10.3 million) during 1988. Global revenues were up 29.8% to F1.8 billion ($897 million) and in Europe, which accounts for 74% of sales, at Europe's fourth-largest computer leasing company. Profits for its leasing activities were up by 10%. But in the United States and Canada the company recorded a loss of F16 million ($8.1 million) during 1988. The effect of the losses on the company's U.S. strategy has been dramatic. It is now in the process of slashing costs in its U.S. subsidiary by 60% and backing out of the Canadian market in favor of brokerage operations.

During 1988, Econocom's main leasing and trading section grew 26% worldwide to F1.6 billion ($823.5 million), which includes nine months of revenues from Econocom France and Ordineco. Econocom increased its stake in these two French leasing companies to 100% in the early part of the year.

Meanwhile, the company's maintenance business shot up by 50% to F47 million ($23.8 million), its consultancy division revenues (based on consultancy, software and training) soared to F25.4 million ($12.8 million) from F3.8 million ($1.9 million), and the company's microcomputer sales jumped by over 100% to F73 million ($37 million). The Ecofinance International group, which concentrates on financing services, isn't measured in the revenues but added F9.7 million ($4.9 million) to profits. These activities were expanded by Econocom's purchase of major stakes in French microcomputing companies RSB and Sofigo and French consultancy Expert France, and a 97% stake in French maintenance firm MAT.

STORAGE TECHNOLOGY CORP.
2270 S. 88th Street
Louisville, CO 80028
(303)-673-5151

58 Uncomfortably accustomed to being the focus of grim news, Storage Technology Corp. is quietly and handily going about its business. Revenues reached $874 million in 1988, the highest mark since 1983, the year before StorageTek filed for Chapter 11 bankruptcy protection. The 16.5% increase over 1987's $750 million is the third increase in a row, each gain larger than the last.

Drastic measures were taken when StorageTek got into trouble early this decade. Founder Jesse Aweida stepped down in favor of corporate turnaround artist Ryal Poppa, half the employees were fired and the expensive and overreaching optical storage project was cut. Following its Chapter 11 reorganization, StorageTek distributed 193 million shares of stock to settle its debts. Those new stockholders will be happy to know the results of these efforts: a tangible profit for 1988 of $44.2 million—1987's profit of $26 million had been negated by a retroactive extraordinary charge related to the bankruptcy proceedings.

Now, with a stable of reliable products, StorageTek is poised to take advantage of resurging customer confidence. Tape products bounced back as the biggest contributor to revenues last year. The 4480 sold very well to customers moving up from the old nine-track 4670, and the Automated Cartridge System (ACS) tape library went from being a drawing-board gamble to a certified money-maker.

Direct access storage device (DASD) product sales were down, due mostly to the company's inability to get its triple-capacity 8380-3X out the door until January 1989. Printer sales were flat. A decline in service revenues was attributed by the company to old machines being replaced by more reliable ones and to being forced to match IBM's maintenance cost cuts.

AMSTRAD PLC
Brentwood House
169 King's Road
Brentwood, Essex CM14 4EF, U.K.
(44-227)-228888

59 The PC clone business is a volatile one. Everything depends on moving product—lots of it—and whatever slows that process down immediately hurts growth.

That was Amstrad PLC's lament for 1988. Badly hit by the memory chip shortage, the British personal computer company lost sales by being unable to produce sufficient volume for the market. On top of that pressure, production of Amstrad's new PC 2000 models, based on the Intel Corp. 80386 and 80286 microprocessors, was delayed until the first quarter of this year by various development crises. Meanwhile, over in Germany, the company's former distributor dumped its remaining inventory on the market, negating Amstrad's marketing efforts.

These problems ate into profits, which were down 12% from 1987, to £92.8 million ($165 million). Total revenues were up 6% to £623.1 million ($1.1 billion). IS revenues also rose 6% to £473 million ($841 million).

According to the Paris-based market research firm Intelligent Electronics, in terms of unit shipments, Amstrad had a 3.4% share of the European PC market in 1988. The company's largest share came from Britain, with 13.6%, or 778,000 units. Unit sales of 787,000 in France exceeded those in Britain, but market share there was lower, at 8.4%. In Italy, where Amstrad has a 3.4% share, 467,000 units were shipped.

Amstrad's status was also elevated above that of a mere clone-maker last July, when chairman Alan Sugar signed a deal with IBM providing each company with access to the other's patents. This should help sidestep any copyright disputes that may arise.

INTERGRAPH CORP.
1 Madison Industrial Park
Huntsville, AL 35807
(205)-772-2000

60 When the computer-aided design, manufacturing and engineering market soared between 1982 and 1984, Intergraph Corp. became a highflier selling VAX-based host systems enhanced with its own graphics processors and software. Then the market cooled, and customers demanded less expensive workstation and PC-based solutions. Intergraph had to scramble.

Intergraph had debuted its workstation strategy in 1985: a line of Clipper workstations based on reduced instruction set computer architecture. When a shortage of RISC chip sets threatened sales in 1987, Intergraph took the controversial step of acquiring the supplier, the Advanced Processor Division of Fairchild Semiconductor Corp.

In 1988, Intergraph's workstation strategy paid off. Total company sales rose 24.8% to $800.2 million, and profits were up 25.9% to $88 million—a stark contrast to 1987, when sales were flat and profits actually fell. A lackluster fourth quarter, caused by softness in non-U.S. sales, was the only drag on an otherwise successful year.

Intergraph introduced a second-generation RISC microprocessor in 1988 and expanded its workstation line with a 27-inch, 2 megapixel workstation. Now virtually every system Intergraph sells includes at least one Clipper workstation, with growth in workstation sales far outstripping growth rates in VAXs. The high level of Intergraph content in the workstations helps keep the margins healthy.

Seagate's fourth-quarter layoff of 1,800 workers will save it $35 million a year

Intergraph has also been busy on the software front and now offers a pair of UNIX-based software environments. One was developed internally for high-end applications. The other for less complex applications is from Bentley Systems (in which Intergraph has a 50% equity stake) and is a virtual clone of Intergraph's VAX-based IGDS. Intergraph is also developing a new generation of UNIX-based applications in the C language. While just over half of its software revenues are still VAX-related, the VAX share continues to drop in favor of UNIX.

MOTOROLA INC.
Motorola Center
1303 East Algonquin Road
Schaumburg, IL 60196
(312)-397-5000

61 Motorola Inc. celebrated its 60th year in 1988, and the celebration seemed never to end. Its sales were at a record $8.25 billion, a 23% increase over the year before, while profits increased nearly 45% to $445 million, a record. Its biggest operations—communications products, semi-

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conductors and general systems products—each posted profit increases of 10%. Motorola's information systems operation, which includes Codex Corp. and Universal Data Systems Inc., turned in a hefty 12% increase in profits, although market factors were working against that operation.

Last spring, Motorola's semiconductor operations introduced a high-powered reduced instruction set computer (RISC) chip, the 88000. And last March, Motorola surprised the industry by unveiling its own 88000-based computer workstation family, called the Delta Series 8000. The company is now competing with its own customers who use Motorola chips in their workstations.

The computer group, which is part of Motorola's General Systems Group, introduced its first RISC VME board-level computer. The group also completed agreements with software companies to market two products to bridge the UNIX and MS-DOS worlds: programs that convert MS-DOS programs into UNIX programs and an emulator that resides on UNIX platforms and emulates IBM PCs.

Although Information Systems Group sales rose 7% to $566 million, price erosion in the modem market caused its Codex operation to scale down expenses. Universal Data Systems added several new products to the data communications line, including new micro-to-mainframe products. DATAMATION estimates that total sales of computers, modems and other communications products at Motorola increased just over 9% to $790 million.

ALPS ELECTRIC CO. LTD

1-6, Yukigaya ohtsuka-cho
Ohta-ku, Tokyo 145
(81-03) 726-1211

62 Although Alps Electric Co. Ltd. entered information processing through the back door of components, the firm is now concentrating its efforts on printers and peripherals, with mouse input devices and disk drives receiving most of its attention. But Alps' performance has been unexpectedly hurt. Its profitability declined because of lowered export values dampended by unfavorable foreign exchange rates. Furthermore, continued price cuts demanded by domestic customers are undercutting gains in IS sales.

Nevertheless, gains in IS revenues offset declines in Alps' other lines, rising 10% to ¥100.6 billion ($785.2 million). Overall sales declined slightly to ¥380.7 billion ($3 billion). Net income was down 27.5% to ¥5.4 billion ($42.1 million).

To address these difficulties, Alps is stepping up its already aggressive overseas production expansion and plans to advance into Southeast Asia, targeting Malaysia or Thailand as promising bases of operation. The company is also considering Brazil. Alps Electric Europe in West Germany is building a new ¥3.4 billion ($26.5 million) plant. In California, Alps Electric (U.S.A.) Inc. is expanding its activity, which includes components imported from Japan, as well as locally manufactured floppy disk drives, boards and mouse input devices.

Alps is the world's largest independent supplier of floppy disk drives, and its sales of hard disk drives are approaching those of the company's floppys in production value. Research and development programs are focusing on information storage systems based on optical disks and other high-density media.

The banking market makes up 35% of the revenues of Olivetti Systems and Networks.

MANNESMANN AG

Mannesmann Ufer 2
4000 Dusseldorf 1, West Germany
(49-211)-8201

63 West Germany's third-largest computer company, Mannesmann AG, spent much of last year reorganizing itself into more flexible, independent business divisions that can react faster to customer demands. The restructuring split the group into Kienzle Computer Systems; Kienzle AUTOCOM (Automobile & Communication); PCS Computer Systems; Mannesmann Tally (printers); and Scangraphic (editing and layout systems), a division built around systems company Alfa System Partner GmbH, which Mannesmann acquired last year.

Revenues were up 12% to DM1.6 billion ($911 million). This increase included a healthy 21% jump in sales in the new Computer Systems Division, as well as help from the financial, retail fuel and public authority sectors.

The company continued to target its traditional midsized customers, putting a strong emphasis on the 9000 family of business systems. In December of 1988, Mannesmann celebrated its 20,000th sale of the product.

On more unfamiliar ground, Mannesmann launched itself into the telecommunications arena last year with fax machines and computer and telephone products, in preparation for the imminent introduction of full Integrated Services Digital Network (ISDN) services in Europe.

The company also made an effort to increase its pan-European business with a new Belgian subsidiary, Mannesmann Information Technology, and by cultivating major orders from banks and fuel retailers in Spain and the Yugoslavian telecom authority. Back home, Mannesmann teamed up with IBM Deutschland to offer a complete publishing solution based on software from its Alfa Control subsidiary and IBM hardware. The first joint deal is to equip Rheinisch Bergische Presse Data GmbH with a 300-workstation system.

MARTIN MARIETTA CORP.

6801 Rockledge Drive
Bethesda, MD 20817
(301)-897-6000

65 For Martin Marietta Corp. and its Information Systems Group (ISG), 1988 looked like success. Corporate revenue was up by nearly 6% to $5.73 billion, and profits were up by more than half, reaching $358.9 million. Not counting sales to other Martin Marietta divisions, the ISG saw revenue increase 8.4% to $743.4 million and profits quadruple to $213.7 million. But take away the $194.6 million one-time sale of the ISG's successful British subsidiary, Hoskyns Group PLC, and you're left with flat IS profits. Besides, a growth rate of less than 10% in the systems integration business is cause for concern.

Early in the year, Martin Marietta won a five-year, half-billion-dollar deal to develop and operate the National Test Bed, a sophisticated computer simulation network for testing and evaluating defense systems for the Strategic Defense Initiative. It's the biggest SDI contract ever awarded and certainly looked to be worth billions more to the corporation when research turned into development. But

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64
Total DP Revenues 756.3

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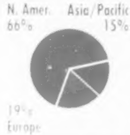


MAINFRAME
632.9

MAINT
123.4

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

Never averse to a bit of glitzy publicity, Cray Research Inc. stitched up a gown made of computer chips to adorn the body of Miss Minnesota at the Miss U.S.A. pageant this year. If that's what became of those defective gallium arsenide chips from the Cray-3, it was one expensive gown: last October, Cray took a $10 million write-off on the faulty chips for the still-in-development supercomputer.

Cray isn't used to failing to develop what it wants to. Cray's longtime habit of investing 15% of revenues in research and development continues to pay off in marketplace success. Bob Ewald, Cray's executive vice president of software, puts it this way: "Fifteen percent is what it took early on, and it still takes 15% to fund existing hardware and software research." In 1988, Cray's 15% R&D habit meant the company spent about $118 million.

Bob Ewald, executive VP of software at Cray

Pleased by the results of past R&D, Cray stockholders aren't always as thrilled by current R&D expenditures. The company's policy of not paying dividends and rolling the money over for future payoffs instead is questioned at every annual meeting. But Ewald states the corporate policy simply: "In an industry that's really expanding, we feel we're better off—can provide a better return to investors—by putting an appropriate amount of money into R&D."

But this year could see a significant R&D shift for Cray. Providing that the final work on the Cray-3 doesn't raise the ante in hardware dollars, 1989 will be the first year in which Cray invests equally in software and hardware. Until recently, Cray believed the major performance improvements lay in hardware. Now software receives equal attention. Says Ewald, "It's a recognition that software is as important as hardware in carrying the business forward."

Ewald reels off a list of the forces that are increasing the software R&D budget: "The need to connect to so many more environments today—workstations, networks, computers—to support different compilers, to recognize users' FORTRAN and C programs." In addition, he says "The nature of scientific computing is changing. It's a broader business than it used to be. It's not a networking business yet, but it's getting there."

Last year, Cray unveiled a parallel-processing FORTRAN compiler for its X-MP and Y-MP machines. Some applications reportedly saw an eightfold speed increase when ported to the eight-processor Y-MP. The other major software project getting R&D funds is an enhancement of UNICOS, the UNIX-based operating system that will, at the software level, marry the number and letter lines. Last year, 35 of 53 Cray machines were shipped with UNICOS.

Despite the bad-chip write-off, Cray managed to hit its yearly earnings projections: $156.6 million, up 6% from 1987, on revenues of $756.3 million, up 10% from $687.3 million in 1987. But Cray hit its target only after a record fourth quarter in which it installed 29 systems (10 more than the previous high in the first quarter of 1987), and only after twice downsizing its 1988 earnings forecast.

In mid-May 1989, in order to maintain twin R&D efforts, one for the Cray-3, the other for the C-90, which is a follow on for the Y-MP, Cray announced it would split itself in two. In an extraordinary move, Seymour Cray, founder of Cray Research, will instead head Cray Computer in Colorado Springs, Colo. The new company will be financed by up to $100 million in cash over the next two years, plus about $50 million in equipment, facilities and inventory. Current Cray Research stockholders will own 90% of the new company; Cray Research will hold 10%. Cray Computer will concentrate on developing the gallium-arsenide based Cray-3, now targeted for 1990 or 1991 delivery. The parent company will focus on increasing earnings by evolving current Cray technology. ▭

Washington waters have turned chilly for Star Wars, and warm expectations are cooling. Also a disappointment was the loss in a bidding war of a contract for the massive upgrade of the federal telecommunications system known as FTS 2000. Originally up against incumbent AT&T, Martin Marietta saw the deal go from a winner-take-all format to a 60–40 split. The company was already thinking about how it would spend the $20 billion or so it expected to realize, when Sprint entered the competition late in the game and took Martin Marietta's share.

In 1988, Martin Marietta actually decreased its research and development budget 11.4% from the previous year to $194.9 million. That's 3.4% of revenues, the lowest percentage since 1983.

CONTINENTAL INFORMATION
SYSTEMS CORP.
1 CIS Parkway
Syracuse, NY 13221
(315)-437-1900

67 Don't ask Harry Goetzmann about hostile takeovers. Continental Information Systems Corp.'s chairman and chief executive officer put his computer-leasing company on the map in 1987 with the unfriendly buy-out of a top rival, CMI Corp. of Bloomfield Hills, Mich. One of many consolidations in the computer-leasing market following the 1986 Tax Reform Act, the buyout made Continental the second largest U.S. computer-leasing firm. It also helped drive the company toward Chapter 11 bankruptcy proceedings.

Just about everything that could go wrong with the CMI acquisition did. Things got ugly when four CMI executives bolted to form another leasing firm, Encore International, taking hundreds of CMI employees and some top accounts along with them.

The merger became an operational nightmare. The computer and accounting systems of the two firms proved incompatible, forcing Continental to keep hundreds of employees working overtime straightening out accounts. Administrative costs went through the roof, and the company became so distracted it seemed to lose a grip on its business.

Continental found itself writing more operating and direct-financed leases, replacing the tax-shelter-based leases that were made obsolete by tax reform. Unlike a tax-shelter-based lease, in which most of the profits are realized at the beginning of the lease, operating or direct-financed leases do not provide a big payout until the lease is up—typically four years.

With a punishing debt load, a parched cash flow and heavy takeover expenses, Continental ran at a loss throughout all of 1988. Banks withdrew their credit lines, and customers shied away. Incredibly, in August, Prudential Insurance Cos. agreed to refinance the takeover debt, but it wasn't enough to stem the tide. As the stock slid from $3 a share to $2 in December, Goetzmann publicly denied rumors of bankruptcy while searching feverishly behind the scenes for a buyer or a cash-rich partner. In January, the company announced it could not make the $3.8 million interest payment due Prudential and said that had filed a petition for reorganization and protection under the Chapter 11 bankruptcy provision. First Boston Corp. is helping to find a buyer.

A third of Intergraph's
sales are made in the
European market.

GENERAL ELECTRIC CO.
3135 Easton Turnpike
Fairfield, CT 06431
(203)-372-2211

68 So what happens when the company president gets dumped and is replaced by the guy who used to be the senior vice president? It turns into a very good year, of course. "It wasn't a big deal for most employees," says GE Information Services president James McNerney Jr., who took over in September after Anthony Craig was abruptly made a "consultant" to GE vice chairman Lawrence Bossidy. A month after McNerney replaced him, Craig surfaced as executive vice president and chief operating officer of Prime Computer Inc. He later became president and chief executive officer.

Although its financial results and those of other GE individual business units are guarded as if they were nuclear war codes, both GE Information Services' net income and revenue rose approximately 10%. Revenues were just shy of $500 million. U.S. income, which for the last few years had been in the pits while the company struggled through the metamorphosis from a time-sharing vendor to a network service provider, soared dramatically and now equals overseas income.

The U.S. comeback was primarily due to MIS acceptance of GE Information Services in the role of intercompany network provider and in-house integrator rather than as a potentially threatening alternative to MIS operations. That self-portrayal will continue this year as the company focuses on deepening its vertical markets in core businesses such as high-tech manufacturing, banking and trade/transportation.

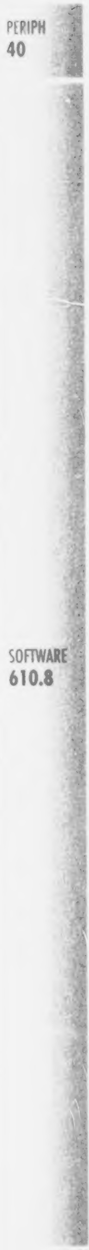
That role will be mirrored, perhaps even more successfully, internationally. As a purveyor of what it claims is the world's largest commercially available teleprocessing network, GE Information Systems has long been strong in Europe. "We're better positioned than anyone else in the world to take advantage of international growth," McNerney claims. "The big story right now is Europe '92. We've always been perceived as a European company in Europe, and that's key to doing business there.

"The rest of the world is scrambling to catch up with us. They're ready to do any deal. But I'm ready to do the *right* deal because I'm already there. I'm feeling very well positioned right now."

CSK GROUP
Shinjuku Sumitomo Bldg. 6-1,
Nishi-Shinjuku 2-chome
Shinjuku-ku, Tokyo 163, Japan
(81-3) 344-1811

69 Last year, CSK Group joined a growing wave of companies aiming to make the systems integration business a key part of their future. Continuing its transformation from a supplier of contract programmers to a full systems development and management services organization, CSK created a new organization to focus on system integration.

The organization, called CSK Systems Integration Services Division, was formed in October. The operation absorbs the bulk of CSK's existing IS businesses. Last year, revenues from these



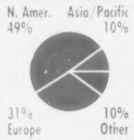
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

New Conquests for The MS-DOS Master

A broader product line puts Microsoft's eggs in several software baskets.

66
Total DP Revenues
718.6

MICROSOFT CORP.
16011 N.E. 36th Way
Redmond, WA 98073
(206)-882-8080



When Intel Corp. announced its latest milestone microprocessor, the 80486, there on the dais demonstrating the speed and power of the new chip on a PC was William H. Gates, chairman and chief executive officer of Microsoft Corp. Lately, Gates' presence has seemed a required imprimatur for important PC product announcements. Since the day Microsoft's PC operating system, MS-DOS, was chosen for Big Blue's PCs, Microsoft has worn a cloak of power few other offspring of the PC explosion have found fitting.

Bill Gates, founder and CEO of Microsoft

Microsoft has fought for its independence, stepping out of IBM's shadow—and making good profits—with Macintosh applications software. At the same time, Microsoft has cultivated its own DOS and OS/2 backyards. These moves have brought the company to the top of the PC software field. Last year, Microsoft's revenues grew 57.3% to $718.6 million. Profits climbed 62.8% to $151.4 million.

Over the past year, Microsoft has been busy introducing OS/2 to the corporate world, preaching the virtues that its new PC operating system has over the current DOS operating system. At the same time, it has been pushing its Windows operating system, a sort of halfway house for DOS users not yet ready to move to OS/2. Windows had a slow start but, Gates told a recent seminar, "Windows has really taken off for us."

Windows' graphical user interface has been the key to the company's recent fortunes, according to Scott D. Oki, senior vice president for domestic sales and marketing. "Graphical applications have really been the strength behind sales of application software this year," he says.

Like its home state of Washington, Microsoft has become known for its apples—in this case, software for Apple Computer Inc.'s PCs. Microsoft had invested in the market early, in 1985, while Apple's Macintosh computer still seemed to be forbidden fruit to many software developers. "We invested in the Macintosh early on," Oki points out, "and it has paid off. We're the number 1 software company for Macintosh products." Microsoft has three of the best-selling programs on the Mac: Excel, a spreadsheet package; Word, a word-processing program; and Works, an integrated software package. The Mac work has given Microsoft's vast army of programmers experience with graphical environments in Windows and OS/2 operating system environments.

Microsoft's greatest success may also have a vulnerable spot: last year, Apple sued Microsoft, along with Hewlett-Packard Co., over the graphical user interface the two developed for HP's New Wave interface. The court battle could take some time to sort itself out and may eventually have an unsettling effect on software development.

Even with dollars pouring in from DOS, OS/2 and Macintosh applications and operating systems, Microsoft is hedging its bets. In February 1989, the company purchased a stake in its longtime UNIX partner, The Santa Cruz Operation Inc. The agreement calls for the two companies to continue their work to bring graphical applications—such as OS2's Presentation Manager—to the UNIX environment. Microsoft has denied steadfastly that its investment in the UNIX-oriented company represents any danger to the success of OS/2. "We see distinct roles for OS/2 and UNIX in the future," Oki says.

Like many others in the PC software business, Microsoft has been bitten by the delayed-shipping bug. In this case, delays have occurred with two of the company's most popular applications software items, Microsoft Word 4.0 for the Macintosh and Microsoft Word 5.0 for the DOS world. Microsoft was expected to have the products ready by January 1989, but then rescheduled shipping for April. The announcement put a blemish on Microsoft's formerly spotless record. ▭

businesses increased 36% to ¥84.6 billion, accounting for nearly two-thirds of the company's overall business.

Revenues from computer services, including contract programming, grew 20%, while revenues from facilities management and allied operations rose 21%. During the year, CSK saw strong returns result from a recent emphasis on developing systems for finance and distribution industries. For example, business from financial customers rose 35% as a result of a concentration on on-line financial systems. In distribution systems, new efforts will focus on advanced point of sale and electronic-ordering systems.

In 1988, growth in CSK's minicomputer and microcomputer sales were strong, but mainframe sales lost ground. An IBM Japan sales representative, CSK registered a 42% increase in revenues from the sale of IBM-manufactured small and medium-sized computers. Software sales and computer services revenues rose, while income from maintenance and leasing operations remained at the same level as in 1987. CSK also established a joint software development venture with IBM Japan.

BELL ATLANTIC CORP.
1600 Market Street
Philadelphia, PA 19103
(215)-963-6000

70 Bell Atlantic Corp.'s struggle to become a mover and shaker in the information business gets better reviews than some of its fellow Bell operating companies. The company has made a string of acquisitions in computer maintenance and leasing, while running a tight shop in its basic phone business. Although 1988 revenues were basically flat at $10.9 billion, net income grew 6% to $1.3 billion.

Bell Atlantic's Caller ID is a system that lets you see who's calling before you pick up the receiver. The company has said that Caller ID is the kind of cutting-edge service that makes being a local phone company fun and exciting. Civil libertarians have called Caller ID a clear invasion of the caller's privacy; it's your business, they say, from where you make your calls. The Consumer Advocate in Pennsylvania filed a complaint trying to stop the service.

In the midst of defending Caller ID, Bell Atlantic found itself in a controversy over its gateway service, which allows users of PCs to hook up to information services. Judge Harold Greene gave the green light to gateway services in 1988, but then declared that Bell Atlantic's decision to provide the service in Pennsylvania, using just one computer—instead of one in each area code—made it an information service, which the company is barred from providing.

In 1988, 11% of Sun's workstation sales were to nontechnical users.

Less controversial were Bell Atlantic's moves to expand its computer maintenance and leasing business, which accounted for some $657 million in revenues in 1988. Four years ago, Bell Atlantic bought Sorbus Inc., the big third-party maintenance firm. But the maintenance market in the United States has tightened up since then. So, Bell Atlantic has branched out into Europe and Canada and has also acquired several small companies that provide self-maintenance service, a fast-growing niche of the maintenance business, in which users maintaining their own equipment are supported by Bell through carry-in repair and parts supply service.

APOLLO COMPUTER INC.
330 Billerica Road
Chelmsford, MA 01824
(508)-256-6600

71 Fierce competition and a strategic miscalculation savaged 1988 profits, as this pioneer workstation maker sought to keep pace with competitors. Earnings plummeted to $2.1 million from 1987's $20.5 million in the wake of a spring pricing offensive targeting rivals Digital, Hewlett-Packard Co. and Sun Microsystems Inc.

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The cuts reduced the price of some workstations by 35%. As a result, in April of 1989, the suddenly vulnerable Apollo Computer Inc. was acquired by Hewlett-Packard for between $500 million and $600 million. The combined unit will control the second-largest hunk of the workstation market—between 27% and 30%, depending on the analyst doing the guesswork.

Apollo, which traditionally occupied first or second place among workstation supplier ranks, had fallen to fourth place in 1988. The pricing strategy certainly aided sales, which rose 18% to $653.5 million for the year. But rather than returning Apollo to the top of the workstation maker ranks, the bargain prices further clouded its long-term outlook and made the company vulnerable to raiders.

The extent of the miscalculation surfaced as Apollo president Roland D. Pampel resigned in the wake of a second-quarter loss. His departure returned Apollo chairman Thomas A. Vanderslice to double duty as president and chief executive officer.

Apollo began the year with its sights set on the profit-rich high-performance workstation market, not on price cutting. It launched a reduced instruction set computing (RISC) product line called the Domain 10000. Joined by a pair of Motorola Inc. 68030-based workstations, the unveilings gave the company's products solid footing at the performance apex of their classes.

Revenues from Europe and Asia/Pacific rose to $372.5 million, or 57% of sales, up from $287.8 million. The biggest revenue gains were posted in Asia/Pacific, a market that now accounts for 19% of sales.

LOCKHEED CORP.
4500 Park Granada Boulevard
Calabasas, CA 91399
(818)-712-2000

72 After just a few years in the information business, Lockheed Corp. wants out. Worried over the post-Reagan era of tighter defense budgets and a possible takeover, Lockheed has decided to concentrate on getting whatever is still to be got from the Pentagon. As part of a reorganization announced in April, Lockheed put four of its main information businesses—CADAM, CalComp, Lockheed Dataplan and Metier—on the block.

Lockheed began its retreat from the information business in 1988 by selling its Dialog Information Services to Knight-Ridder. The four companies now up for sale accounted for 95% of Lockheed's IS revenues in 1988. CalComp, which came to Lockheed in 1986 through the acquisition of Sanders Associates Inc., saw revenues of $450 million last year. Despite fierce price cutting in the market for plotters, displays and digitizers, demand for these products showed steady growth among architects and designers, enabling CalComp to post a 22% increase in sales.

CADAM won status as a preferred vendor to General Motors Corp. for its enormous C-3 CAD/CAM/CAE development effort. CADAM posted a 24% increase in sales. Metier, the leading provider of project management software, extended its reach into the VAX market and also formed an alliance with Symantic of Cupertino, Calif., which sells the TimeLine project management package for personal computers. Metier's sales were up 9% to $100 million.

Lockheed is also selling its small Lockheed Dataplan business, which provides flight-planning and weather services, but it is holding on to Datacom Systems Corp., of Teaneck, N.J., which supplies computer services to state and local governments.

COMPAREX INFORMATIONS
SYSTEME GMBH
Gottlieb-Daimler-Strasse 10
D-6800 Mannheim 1, West Germany
(49-621)-40090

73 After a year of merger consolidation, Europe's leading plug-compatible manufacturer (PCM), Comparex Informationssysteme GmbH, concentrated on establishing its own identity and strengthening its operations across the Continent in 1988.

Formed by the merger of the PCM operations of West Germany's BASF Group and Siemens AG in early 1987, Comparex inherited a strong dependence on the German market for its revenues. This could become an unhealthy dependence in the advance toward a single European market in 1992. Therefore, the firm's management is eager to achieve a better

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balance of sales across European countries.

Last year's revenues of DM1 billion ($569 million), were up by 13% over 1987's figures. About half of that total came from the company's home market in Germany, but growth rates were higher in Comparex's other major European markets in Britain, France, Italy and Spain.

Outside Europe, the company picked up another 17% of revenues from the Middle East and Africa, especially South Africa, where the company distributes Hitachi Ltd. processors via local agent Persetel.

To keep pace with its European expansion, Comparex hired 8% more people last year, bringing the total work force to 1,127—642 in West Germany and 485 in the firm's subsidiaries. Much of this increase was in the areas of consultancy, systems and user software support, technical support and training—part of a company strategy to avoid becoming just another hardware supplier. In fact, since its expansion into in-house systems engineering and performance management services last year, nearly two-thirds of Comparex's personnel now work in customer support groups.

The company's expansion across Europe is far from over. It plans to complete the acquisition of the European operations of National Advanced Systems in the next few months—but still maintains that with or without this business, it expects to double 1988's growth this year.

MINISCRIBE CORP.
1861 Lefthand Circle
Longmont, CO 80501
(303)-651-6000

74 As late as Thanksgiving of 1988, Miniscribe Corp. executives were projecting rosy year-end results. A week later, they hoisted storm warnings, followed shortly by a full-scale SOS. Within three months, president Q.T. Wiles was out, and Miniscribe was in the hands of turnaround specialist Richard Rifenburgh. The company reported a $14.6 million loss in the fourth quarter.

Miniscribe seems to be a victim of that deadly double-bind: over-optimism and excessive denial. In the face of what was clearly slumping demand, Miniscribe kept pumping out disk drives, allowing both its accounts receivables and inventories to balloon. By the end of the year, the ratio of inventory to sales was 43% (the industry norm is 24%), while accounts receivables were at 122 days—far above the industry average of about 70 days.

Even without the slowdown in demand, Miniscribe was facing a difficult transition away from its mainstay 5¼-inch disk drives. The company was already behind with its new generation of 40 megabyte 3½-inch disk drives, and it was cutting back on research and development spending.

Under Wiles' stewardship, beginning in 1985, Miniscribe grew phenomenally. Rifenburgh, who honed his turnaround skills at Oxoco and GCA Corp., is a partner with Wiles at Hambrecht & Quist Investment Partners. One of his first actions was to announce that Miniscribe will restate its 1988 results (earnings of $25.9 million on sales of $603.3 million) and probably its 1987 figures, as well. He also began cutting overhead, eliminating some 2,350 jobs—mostly in Singapore and Hong Kong, but several hundred at the Colorado headquarters, as well.

MINNESOTA MINING AND MANUFACTURING CO.
3M Center
St. Paul, MN 55144
(612)-733-1110

75 3M reached two magic milestones in 1988: $10 billion in total sales and over $1 billion in profits. Data products are just a tiny piece of that $10 billion pie. 3M is really one small business after another—45 different product groups using some 111 technologies. In a time of leveraged buyouts and corporate restructurings, 3M gets high marks from analysts for taking the long view of things, investing in internal growth and very selective acquisitions. 3M plowed $650 million into R&D in 1988.

The mainstay of 3M's Data Storage Products Division is the ¼-inch tape cartridge, a product 3M invented in the early 1970s that is now coming into its own as the backup medium of choice for small and midrange systems. Santa Clara Consulting Group estimates that data cartridges account for nearly half of the

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company's $563 million in sales of magnetic media products, up nearly 24% over 1987's figures. 3M virtually owns the cartridge market, controlling market share and technology. 3M has developed a cartridge that stores 320 megabytes of data and has promised to deliver a 1 gigabyte cartridge within two years.

3M has extended its IS reach beyond just magnetic media. In 1987, it acquired the HELP hospital information management software from Control Data Corp. and now has a VAR agreement to market the system on hardware from Tandem Computers Inc.

3M is also pursuing image processing. Through its newly formed Document Systems Division, 3M sells the FileNet Workflo image-processing software. 3M also has a stake in EOTEC Corp., a West Haven, Conn., company that specializes in fiber optic sensing systems, a $100 million niche market in the burgeoning fiber optics field.

TEXAS INSTRUMENTS INC.

13510 North Central Expressway
Dallas, TX 75243
(214)-995-2011

76 In a replay of 1987, Texas Instruments Inc. made more money from suing copycats than it did from selling computer systems and software. Royalty payments following patent infringement suits against eight Japanese chip makers and one Korean supplier swelled TI's coffers by $124 million last year. Which is just as well: TI's Digital Products Group, which includes the firm's IS business, as well as calculators, industrial control systems and hearing aids, lost money for the second year in a row. Last year's loss of $53 million—greater than 1987's $28 million loss—took place as the chip maker experimented with a new strategy that emphasizes AI-based software more than "me too" minis and other hardware. TI's IS revenues of $577 million were about flat with 1987's figures and provided only 9% of the company's total business.

Leadership in technology was the keynote of the Dallas chip maker's year. TI celebrated the 30th anniversary of its invention of the integrated circuit by announcing its invention of a new kind of IC. The company revealed its quantum-tunneling transistor, which is 100 times smaller and 1,000 times faster than current devices. It is targeted for commercial chips in the mid-1990s, TI says. Booming worldwide semiconductor markets also provided a reason to celebrate: TI's net sales grew 13% to $6.3 billion, and net income jumped to $366 million.

The company is trying to translate technological leadership in other operational areas into products and services that will offset the perilous cyclical nature of the chip business. TI, by consensus, has one of the most sophisticated internal IS shops in the world, as well as one of the best global computer networks. Pioneering work in electronic data interchange (EDI) has been one offshoot, which is now being augmented by consulting, network services and software to customers and suppliers.

RACAL ELECTRONICS PLC

Western Road
Bracknell, Berkshire RG12 1RG, U.K.
(44-344)-481222

77 Nineteen eighty-eight was a mixed year for British data communications company Racal Electronics PLC.

On the one hand, the company reported worldwide IS revenues down slightly to £311.4 million ($556 million).

On the other hand, Racal celebrated one of the largest and most prestigious deals in its history—a $510 million 10-year contract to provide a government data network in Britain. By 1995, the network will link 240,000 computer terminals in the largest British government departments: Health, Social Security, Inland Revenue (Britain's IRS), Customs and Excise, and the Home Office.

Much of the company's 1988 IS revenues—around 65%—came from the United States, where the company owns network systems supplier Racal-Milgo in Sunrise, Fla., and modem maker Racal-Vadic in Milpitas, Calif. Earlier this year, the company added two new subsidiaries to its U.S. operation when it bought fiber-optic specialist Quanta Communications Systems Inc. in Anaheim, Calif., and local area network firm Interlan Inc. in Boxborough, Mass. The companies are now trading as Racal Quanta and Racal Interlan. Racal's latest venture is with Telecommunications Enterprises Inc., based in Charlotte, N.C., in a joint company called Racal-Milgo SkyNetworks, which offers satellite-based network services.

The company also boosted its European presence in 1988 by adding Paris-based data communications system and equipment supplier Walton SA to its Racal Data Group in Europe. More acquisitions are expected this year as part of Racal's strategy to increase its European business and marketing spread in preparation for the single European market in 1992. The company already has Racal-Milgo subsidiaries in West Germany, the Netherlands and Belgium, and it is building up business in Italy, where it bought local modem company Applicazioni Radio Elettroniche (ARE) in 1987.

With the British government contract under its belt and a broader marketing base, Racal hopes increases in its European business will help pull it back into growth this year.

FINSIEL SPA

Via Isonzo, 21/B
00198 Rome, Italy
(39-6)-851505

78 After opening its first overseas office in San Diego in 1987, Italy's largest software and services company, Finsiel SpA (Finanziaria per i Sistemi Informativi Elettronici), made further forays into foreign lands last year. It began operations in Cyprus, Greece and Spain, providing software and services to local government offices. Further afield, the company also signed a services deal in Moscow last October with the Soviet State Committee for Information Technologies.

This expansion strategy helped Finsiel to boost its revenues to L710 billion ($545 million) in 1988, an increase of 29%. Reflecting the importance of personnel resources in the services sector, the size of the staff rose 21%, reaching 4,912 by the end of the year.

Many of those new employees were hired in Italy, where the firm set up four new subsidiaries. Two of them—Datasiel in Genoa and Sispi in Palermo—are software partnerships with local governments. The third subsidiary—Netsiel, in Bari—is a CASE software center providing network and computer facilities to the whole Finsiel group, which includes 13 other firms operating in banking, finance, services and public agency sectors. Finally, Finsiel formed a joint venture, called Telesoft, with the Italian state telephone company, Sip, to develop telecommunications-related software.

More joint ventures in the local government and networking sectors both inside Italy and other European countries are expected this year.

SONY CORP.
7-35, Kita-Shinagawa 6-chome
Shinagawa-ku, Tokyo 141 Japan
(81-3)-448-2111

79 Last year, Sony Corp. began new efforts to diversify its product portfolio, leveraging its worldwide research network and extensive technology base to cover a much wider range of industrial products. As a part of those efforts, Sony expanded its overseas marketing and production efforts. For instance, Sony Microsystems Inc., a U.S. engineering workstation subsidiary, began manufacturing the Sony NEWS, a 32-bit UNIX workstation. The diversification efforts also include a new concentration on high-growth business areas, such as information-processing equipment, electronic components and telecommunications systems. As a result of these efforts, Sony's international IS revenues, while small, grew faster overseas than they did at home last year.

Still, Sony's major IS market continues to be in Japan. The NEWS series of workstations has proved a success in Japan's fledgling engineering workstation market. The company has made inroads into computer-aided software engineering (CASE) and desktop publishing markets with the system. Moreover, it continues to expand the NEWS series with lower priced models, as well as with versions equipped with optical disk subsystems and desktop-publishing enhancements.

Sales of 3½-inch floppy disk drives and diskettes, which Sony helped pioneer, are doing well, as U.S. PC vendors expand their purchases. Last year, Sony began to produce diskettes and drives in the United States. The company hopes to duplicate its 3½-inch drive success with new 2-inch storage drives. The new drives, which began shipping in mid-1987, are available for portable word processors.

EMHART CORP.
426 Colt Highway
Farmington, CT 06032
(203)-678-3000

80 Emhart Corp. has been on the DATAMATION 100 list for three years because it acquired Planning Research Corp. (PRC), of McLean, Va., and Advanced Technology Inc. (ATI), of Reston, Va., both of which provide computer services to the government. Next year, the Emhart name should be gone.

The terms of the company's recent agreement to be acquired for $2.8 billion by Black & Decker Corp. call for the sale of these two companies, which last year accounted for $654 million of Emhart's $2.7 billion in revenues. Emhart had acquired them as part of a massive three-year restructuring to enhance its growth rate, which in the early 1980s had been languishing at around 2%.

Last year, after shedding 18 businesses and adding two others, Emhart reported a 13% increase in revenue and 19% growth in earnings. It also ended the year with a $2.1 billion backlog. That kind of growth attracted corporate suitors, some not so friendly. Black & Decker was the white knight.

The up-for-sale Information and Electronic Systems (IES) sector saw its revenue increase in 1988 by 25.7% to $508.9 million. But financial analysts noted that rapid growth could be a thing of the past. For example, 78% of PRC's and ATI's business is from the federal government, particularly from now-flattening defense-related projects. Bob Larose, former chief executive officer and founder of ATI, quit the company last October, along with his chief financial officer, and could be a source of competition for government contracts.

WYSE TECHNOLOGY
3471 N. First Street
San Jose, CA 95134
(408)-473-4411

81 After two years of skyrocketing growth, Wyse Technology crash-landed in 1988. Beginning in the summer, demand for Wyse's personal computers simply evaporated. And in the last quarter, sales were down 50%, scoring a $26.4 million loss. For the full year, sales rose 23.3% to just under $500 million, a far cry from the 74% growth rate Wyse saw the year before.

The sorry performance caused some bloodletting in the executive suite. Philip White, an ex-IBMer and computer industry veteran who joined Wyse in 1986 from Altos Computer Systems, resigned as chief operating officer, although he continues as a director.

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Wyse officials attributed the problem almost entirely to the company's decision to raise prices 10% to counter the higher cost of memory chips, a result of the notorious DRAM shortage that altered the fortunes of so many computer companies in 1988. The public, accustomed to Wyse's low-ball prices, stayed away in droves, leaving Wyse's distributors with a load of hardware. Wyse also suffered from the bearish attitude toward high-technology stocks that prevailed on Wall Street for much of 1988. A 1.7 million share stock offering scheduled for August had to be postponed.

After Wyse lowered its prices, revenues began the slow upward climb back to the $100 million-plus level in the first quarter of 1989. In addition to the price cut, Wyse also announced two new high-end 286- and 386-based machines, hoping the higher margins for these more powerful machines can help bolster Wyse's sagging profits. Wyse also introduced two new terminal products; unlike its PC business, sales of Wyse's terminals remained steady throughout the year.

LOTUS DEVELOPMENT CORP.
55 Cambridge Parkway
Cambridge, MA 02142
(617)-577-8500

82 Besieged by development problems with 1-2-3's long-awaited Release 3, Lotus suffered an exodus of development and marketing executives, and its previously stellar financial record was marred. The company experienced its first earnings decline since bursting onto the software world seven years ago with 1-2-3.

The problems caused by Release 3's delay were painfully evidenced by an abrupt sales decline in the latter part of 1988. Although industry sales galloped along at an estimated 40% annual growth rate, Lotus' revenues rose a comparatively weak 18.4%, reaching $468.5 million from $395.6 million a year ago. The increase—half the percentage gain achieved in 1987—was largely thanks to first-half sales performance. In the final quarter, revenues were off modestly and earnings fell a steep 61% compared with figures from the same period of the previous year.

The fourth-quarter profit drop would have been even worse had not the weak U.S. dollar boosted sales outside the United States. International sales in the fourth quarter rose to 38% of total revenues from about 30% in the equivalent period of 1987. For the year, revenues from outside its home market rose to 34% of total sales, or $159.2 million, from $114.7 million the year earlier.

Despite the company's offshore success, many 1-2-3 users held off buying additional packages or looked elsewhere, and earnings for the year fell 18% to $58.9 million from $72 million. Major corporations that had made 1-2-3 a PC standard began adding Redmond, Wash.-based Microsoft Corp.'s rival Excel spreadsheet to their software libraries. The Release 3 delays create a domino effect on products—and sales and profits—whose releases must await the updated spreadsheet. The package is being rewritten in the portable C language to pave the way for promised mainframe, minicomputer and graphical versions.

NCR made 58% of its sales outside the United States; over two-thirds of its manufacturing is done in the United States.

AST RESEARCH INC.
2121 Alton Avenue
Irvine, CA 92714
(714)-863-1333

83 AST Research Inc. made its name in the early 1980s with PC enhancement boards, such as SixPakPlus and Advantage. When Big Blue switched gears in 1987 to the PS/2 personal computer, AST had already decided to make its own machines. It's a good thing it did. In 1988, system products accounted for 70% of AST's $459 million in sales and were the only part of its business that really grew.

The Premium/286, AST's first PC, continued to be the company's best seller, but by the end of the year revenue growth was virtually flat. Some of the slack was picked up by the Premium/386. Two new 386-based PCs, the AST Premium 386/25 and the Premium Workstation 386SX, were expected to begin shipping by this summer.

The switch to higher margin PCs enabled AST to announce, in March of 1988, the company's first year-to-year earnings increase in two years. But that was almost the only good financial news that AST was able to report in 1988. Profit margins were squeezed during the rest of the year, with the company losing $8.6 million in the last six months. AST lowered its prices, cut staff and sold off a subsidiary that makes laser printers and add-on boards for Digital computers. In the first calendar quarter of 1989, sales rose 7.8% and losses were down to only $1.3 million.

ANACOMP INC.
11550 N. Meridian Street
Indianapolis, IN 46240
(317)-844-9666

84 Anacomp Inc., a big player in the computer output microfilm (COM) business, made a successful $400 million tender offer last August for Xidex Corp. of Palo Alto, and joins the DATAMATION 100 for the first time.

Anacomp operates 56 centers in the United States, which convert computer documents to microfilm. The company had acquired the Datagraphix division of General Dynamics Corp. and Consolidated Micrographics Inc., which makes COM duplicators. Datagraphix gave Anacomp a line of COM recorders, processors and duplicators. Xidex, which makes COM readers and reader/printers, also was Anacomp's biggest supplier of diazo and vesicular films.

Xidex started out in the microfilm business and turned to other forms of computer storage in the mid-1980s. Through acquisitions, the company virtually tripled its size, while also capturing 60% of the rigid disk market and 25% of the market for flexible disks. But, two years ago, growth and rapid market changes left the company with a load of obsolete machinery and its first loss in nine years. In 1988, magnetic media sales were flat at $455.4 million. Anacomp plans to spin off the business, retaining, however, some control, but including third-party investors.

Louis P. Ferrero, Anacomp's chairman and chief executive officer, says the $70 million debt the company acquired to help pay $128 million for Datagraphix has been paid off. Anacomp has prepaid $16 million of a $260 million bank loan taken out for the Xidex acquisition by selling off assets, including a thin-film division, sold to HMT Technology Corp., a subsidiary of Hitachi Metals Ltd.

NORSK DATA AS
Olaf Helsetsvei 5
P.O. Box 25, Bogerud 0621
Oslo 6, Norway
(47-2)-62-60-00

85 There isn't much left to shout about at Norway's pride and joy, minicomputer specialist Norsk Data AS. Although 1988 revenues rose slightly to NKr2.93 billion ($450.2 million), the company reported crippling pretax losses of NKr271 million ($42 million). That followed a massive 49% drop in profits the year before.

This sad Nordic saga was the result of two key factors. First, the company was overly dependent on its home market of NorwayThe Norwegian government sector had been a faithful buyer in previous years, but the company lost strategic orders during 1988 to Apple Computer Inc., Digital and IBM. The climax came when the French firm Groupe Bull snatched a prestigious contract with the Norwegian Foreign Office.

Second, Norsk's president, Rolf Skar, had failed to come to grips with technological changes and rising customer demands, which had put pressure on margins. In particular, users in the government sector demanded compliance with standard operating systems. Norsk had always been proud of its high-performance proprietary systems, but no matter how good these were, they simply didn't fit what the customers wanted.

The shell-shocked company has now begun a massive reorganization of its production, marketing and product strategies, which will include some 800 layoffs. A new Dolphin Computers subsidiary has been formed to build reduced instruction set computer (RISC) systems based on Motorola Inc. processors, and Norsk has announced a string of alliances with companies such as Microsoft Corp. and The Santa Cruz Operations Inc. for UNIX-based systems, and with Sybase Inc. for a relational data base system.

AMERICAN EXPRESS CO.
World Financial Center
American Express Tower C
New York, NY 10285
(212)-640-2000

86 Insiders in banking and finance fear and respect American Express Co. as a very savvy user of information technology. Now the credit card king is trying to show the rest of the world how good it really is.

American Express announced this past April that it is consolidating its various information services subsidiaries into a single, separate company and released earnings and revenue statements for this unit. The size of the group surprised even those who follow American Express closely: earnings of $63 million on revenue of $447 million. The biggest chunk of that is First Data Resources Inc., the credit card processor American Express acquired in 1980. But the new unit, called American Express Information Services, is also involved in telemarketing, fund transfers and automation in the health care and cable television industries.

First Data Resources is one of the largest processors of Visa and Mastercard transactions. (American Express does its own credit card transactions through another unit of the company.) First Data Resources also provides information services, such as Medicaid processing, to state and local governments.

Another major component of the new information services unit is the Health Systems Group, which provides services and turnkey systems to more than 1,000 hospitals and medical facilities. It recently acquired McDonnell Douglas Corp.'s health systems unit.

The new focus on information services is American Express' first big strategic move since the surprise departure in March of president Louis V. Gerstner, who left to head RJR Nabisco Inc. Gerstner was widely credited with being a key strategist behind American Express' recent growth.

MAI BASIC FOUR INC.
14101 Myford Road
Tustin, CA 92680
(714)-731-5100

87 When it went public in 1986, MAI Basic Four Inc. launched an aggressive acquisition program in which it netted 30 software, computer maintenance and distribution companies. Two of these included the buy back of MAI Canada Ltd. and a part of Sorbus Inc. The Sorbus buy was partially responsible for the more than doubling—to $147 million—of MAI Basic

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Four's 1988 revenues from computer maintenance.

The synergistic nature of the company's acquisitions strengthened its position as a worldwide supplier of medium-sized computers to small and medium-sized businesses. MAI Basic Four says its installed base now approaches 40,000. But with computer sales growing only 10 to 11% a year, and competition from larger companies—including IBM—intensifying, MAI Basic Four's long-term growth prospects weren't the greatest. So its two largest stockholders went looking for a buyer. When one wasn't found, the company went on offense and, last November, launched an unfriendly takeover of Prime Computer Inc., a company three times bigger than MAI in terms of revenues. Although MAI this spring had amassed 61% of Prime's shares, the matter still is unsettled, and Prime is fighting the takeover bid in court.

In June 1988, MAI introduced a workstation, the MAI 1200 Business Workstation, which can stand alone using PC-compatible software or be linked to hosts through the company's MAI PC-Link. The company also introduced two 32-bit superminicomputer systems—one that increases performance of its older MPx 9400 by two and a half times and a second that operates twice as fast as an older MPx 9600.

Last year, the booming maintenance business helped boost MAI's total revenues to $443 million, 32.6% over 1987's revenues of $334.2 million. Its earnings inched up slightly to $24.3 million from $23.9 million the year before. The lower profit margins resulted from smaller markups of maintenance and applications software and lower hardware gross margins due to competitive pricing pressures.

NYNEX CORP.
335 Madison Avenue
New York, N.Y. 10017
(212)-370-7400

88 In 1988, NYNEX Corp. joined Bell Atlantic Corp. as the second regional Bell holding company to make the DATAMATION 100 since divestiture. NYNEX did it through both homegrown talent and acquisitions, assembling a stable of software and professional services subsidiaries—christened the NYNEX Information Solutions Group (ISG)—that did some $430 million in revenues in 1988 and employs 5,500 employees in 13 countries.

The big player in the ISG fold is AGS Computers Inc., the Mountainside, N.J.-based software and professional services firm acquired last year. AGS has also refocused away from off-the-shelf mainframe software in favor of systems integration and professional services. Ironically, one of its biggest customers is AT&T. AGS is also strong in banking and finance, talents that NYNEX hopes to marry with those of Business Intelligence Services Ltd., the British firm well known for its banking software, acquired by NYNEX in 1987.

The AGS and BIS acquisitions bolster NYNEX's own units, which include NYNEX Computer Services, its professional services firm, NYNEX Development Corp., which manages new ventures in information processing, and the recently formed Complex Systems Integration Group. Already, NYNEX has its hands full as an integrator: it is one of the vendors putting together Empire Net, the $180 million digital voice/data network that New York state is installing to link 98 state agencies, including the 4,000 state lottery sales agents.

The ISG's $430 million in annual revenues is just a blip on the income statement for NYNEX, which had total 1988 revenues of $12.7 billion. A. Theodore Engkvist, president of the ISG, wants to see revenues of $1 billion by 1993. But growth won't come easily. Because the ISG has virtually no presence in the federal government arena, Engkvist is betting that private firms will begin to contract for bigger integration jobs, up from the $1 million to $2 million systems integration contracts that are currently the norm for the commercial sector.

HARRIS CORP.
1025 West NASA Boulevard
Melbourne, FL 32919
(407)-727-9100

89 Harris Corp. sales for calendar 1988 stalled at $2.10 billion, not a big improvement over the $2.08 billion posted in 1987. Net income was $69.6 million, sharply lower than the restated income of $124.7 million for calendar 1987. Net income for 1987 had originally been announced at $92.2 million before the corporation changed its method of accounting for income taxes.

Sales to the U.S. government continue to make up roughly 50% of total company sales. But a smaller and smaller proportion of Harris' federal sales are coming from the Information Systems Sector, a business that continues to battle lower sales and sharply lower profits. Revenues from sales of information technology at Harris fell nearly 5% in 1988. The problem, according to the company, is weak sales of data terminals and systems, as well as reduced computer shipments for government programs. Harris tried to combat the problem in July by merging the Information Systems Sector with the successful Lanier Business Products Sector, best known for its voice communications products.

It remains to be seen what synergy Harris' Semiconductor Sector gains from the company's November $206 million cash acquisition of General Electric Co.'s Solid State operations. The immediate result of the acquisition has been voluntary and involuntary layoffs in Harris' Semiconductor Sector.

Products continued to emerge from Harris in 1988, among them the Night Hawk family of supermicrocomputers, which operate at speeds of up to 48 million instructions per second and are designed for the real-time simulation market. The company inked joint-marketing relationships with some well-known software vendors, including Informix Software Inc. and Oracle Corp.

ORACLE CORP.
20 Davis Drive
Belmont, CA 9400
(415)-598-8000

90 Ancient oracles inhaled gasses emanating from the earth and, entranced, foretold the future. Oracle Corp. must be inhaling appetite enhancers: sales have doubled every year since the company's founding in 1977. In 1988, revenues grew by 114.4% to $424.6 million, and profits were up almost 110% to $62.1 million. Oracle is now the fourth-largest independent software vendor after Computer Associates International Inc., Microsoft Corp. and Lotus Development Corp.

Oracle's success in the market for data base management systems is based on the number of different platforms its software will run on. The company recently claimed its software runs on computers from 55 makers. Oracle's market depth comes from dominating the Digital marketplace. Computer Intelligence Corp., estimates Oracle holds 31% of the relational DBMS market for Digital machines, while Digital's own relational data base system trails at 27% of the market.

But Oracle's success in the midrange market has thus far been unmatched at the top and bottom: IBM's DB2 relational software owns the mainframe marketplace, and Ashton-Tate's dBase outsells Oracle's PC DBMS by more than a quarter million shipments. Oracle is pinning its hopes for growth on applications packages that work with its DBMSs; on increased transaction-processing capabilities; and on its expanding, three-year-old consulting practice.

In November, Oracle went shopping, buying Falcon Systems, a systems integrator in the government market. New product announcements during the year focused on Oracle's Version Six, an RDBMS based on a server architecture, and Oracle TPO, a transaction-processing system that works with Version Six. New applications packages included Oracle Financial and Oracle Mail.

SCIENCE APPLICATIONS
INTERNATIONAL CORP.
10260 Campus Point Drive
San Diego, CA 92121
(619)-546-6000

91 After 20 years as a highly specialized defense contractor, Science Applications International Corp. (SAIC) is going after software and systems integration work. In 1988, it hit the jackpot: a $1 billion, eight-year megacontract to create a medical information system for the more than 700 U.S. military hospitals and clinics around the world. That helped boost the employee-owned company's 1988 IS revenues to $386 million, just under 45% of its total sales and a 24.9% increase over 1987.

SAIC was founded in 1969 by a group of research scientists led by physicist J. Robert Beyster. Sitting on its board today are former defense secretary Melvin Laird and former deputy director of the CIA, Bobby Inman.

Beyster wants SAIC to become a $1 billion company by next year but knows he can't just rely on the national security-type contracts SAIC has gotten in the past.

SAIC is taking on Wang Laboratories Inc. and FileNet Corp. by marketing an optical disk-processing system through IBM. (One of the first customers was the White House.) The company also develops mainframe software—focusing on data storage, system backup and application migration tools—for several leading companies. It is seeking Hollywood producers to participate in marketing a high-definition television system it has created. And it was responsible for the nearly half-million dollars in computer simulation and analysis tools that enabled yachtsman Dennis Conner to regain, albeit briefly, the America's Cup in 1987.

92 Acer Group is spotlighted in the profile on page 144.

SHARED MEDICAL SYSTEMS CORP.
51 Valley Stream Parkway
Malvern, PA 19355
(215)-296-6300

93 A third year of adverse conditions in the hospital marketplace caused Shared Medical Systems Corp.'s overall revenues to decline 3.1% to $378.7 million in 1988. Net income was worse, down 35.1% to $29.4 million.

One industry analyst reports that every vendor, not just SMS, felt the effects of that market's blues. "I think 1988 represented the bottoming out at Shared Medical. Revenues got about as low as they're going to go," says Steve McClellan, first vice president at Merrill Lynch Research & Economics in New York City. Shared Medical's turnkey systems business and its software sales business have been the most depressed, McClellan says, because of a shift at hospitals from buying big-ticket turnkey systems to purchasing shared, remote data services.

Indeed, SMS confirms that sales of Independence, its patient care and financial software for IBM mainframes, were weak last year. However, sales of the company's VAX-based turnkey system, Allegra, won the company new contracts in its first full year on the market. SMS got the system through acquisition and reintroduced it at the beginning of last year.

A few other spots were also bright. Physician Services, which accounts for approximately 10% of SMS' revenues, sold to some large clinics where SMS had not previously been successful. A company spokesman says the success was due to the search by those larger clinics for a single vendor's system that integrates billing, scheduling and other hospital functions.

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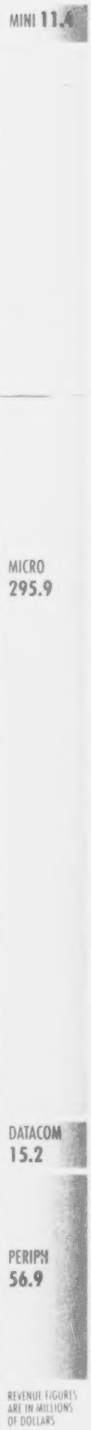
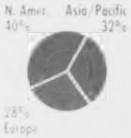


Taiwan's New PC Powerhouse

Acer, the new kid on the DATAMATION 100, began life with $25,000 and 11 employees.

92
Total DP Revenues 379.4

ACER GROUP
602 Ming Sheng East Road
Taipei, Taiwan
(886) 2-713-2252



Two years ago, Stan Shih, the ambitious president of Taiwan's largest and fastest growing IS firm, Acer Group, surprised many analysts with a forecast that his company would reach $1 billion in revenues by 1991. It seems Shih underestimated his company's potential. Now, K.Y. Lee, the company's vice president of product strategy, says Acer is shooting for $800 million next year and $1 billion by 1990.

That's not bad for a company that began in 1976 as a small family operation with $25,000 and 11 employees. In 12 years, "the Compaq of Asia," as Acer has been called, has become a half-billion dollar company operating through a network of over 1,000 dealers in 41 countries, with subsidiaries in Europe, Japan and the United States.

Last year, revenues rocketed up by 45%, from TD10.5 billion ($366.7 million) to TD15.2 billion ($530.8 million), and profits surged by 62% to TD786 million ($27.4 million).

Stan Shih, Acer's chairman and founder

Around two-thirds of Acer's revenues are from the IS sector. PC products account for 70% of all IS dollars. Additional sales come from peripherals, data communications equipment and UNIX-based multi-user systems. Low-cost IBM PC-compatible machines are still the firm's prime money earners, but Acer is determined to overcome the stigma that cheap, illegal clones have given the Taiwanese PC industry. In 1988, Acer invested $20 million in R&D projects covering UNIX, PCs, peripherals and communications products.

Acer's current microcomputer offerings range from basic PCs to PS/2 model 30 and 50 clones; 25% of revenues come from the firm's 1100 family of 80386-based machines. Acer builds PCs for Unisys Corp., West Germany's Siemens AG, Japan's Canon Inc. and Dutch firm N.V. Philips' GL, among others.

Yet, Acer still has to build brand name recognition outside Southeast Asia. This year, it is investing $20 million in advertising and marketing overseas.

In late 1987, it began manufacturing its high-end models in the United States, under an agreement with Texas Instruments Inc. "We want to push our computers in the U.S. and give them the made-in-America image," says Lee.

The United States accounted for 40% of Acer's revenues last year, aided by the acquisition of the San Jose-based UNIX company Counterpoint Computers Inc. The U.S. firm changed its name to Acer Counterpoint Inc. last summer, and a few months ago it was brought under the control of the main U.S. Acer Corp. subsidiary in Atlanta.

Acer's in-house knowledge of the UNIX market is not strong, and it has been looking around for development help. Counterpoint's Japanese distributor, Chiyoda Joho Kiki, which installed the first Acer System 19K UNIX machine in Japan last year, is assisting the development of a communications software interface that will link Acer PC AT-compatibles with Counterpoint's UNIX systems.

Technical problems aren't the only one Shih will have to overcome this year. Production costs are rising, due to IBM's decision last year to collect royalties from the IBM PC clone makers. IBM also slapped a royalty fee, ranging from 1 to 5%, for the Micro-Channel Architecture (MCA) used in the PS/2-compatible line. While Acer will not disclose the details of a patent license arrangement it struck with IBM last year, product vice president Lee says the company is now better able to absorb the additional costs of MCA, due to the recent drop in the price of memory chips.

But Acer isn't placing all its bets on IBM's MCA. The company was among the earliest members of the Extended Industry Standard Architecture (EISA) consortium, which is promoting an open microcomputer architecture. Acer plans to launch its first EISA machine by early 1990. ▭

SEMA GROUP PLC
22 Long Acre
London WC2E 9LY, U.K.
(44-1) 379-4711

94 European services company Sema Group PLC enters the DATAMATION 100 for the first time in the 1988 survey. Sema Group was created by the merger of one of France's leading software and service companies, Sema Metra, and the British-based CAP Group.

Sema is legally incorporated in London, and its chairman, Barney Gibbons, is British. Yet, the company is quoted on both the London and Paris stock exchanges, and the majority of the equity is in French hands, with services giant Cap Gemini Sogeti holding a 22% stake and the French bank, Paribas, holding 39%.

IBM's U.S. business stalled, but Big Blue achieved double-digit growth in Australia, Italy, Japan and Latin America.

Combined company revenues in 1988 totaled £266.9 million ($474.9 million, at £.562 = $1). Excluding the Sofres market research subsidiary in France, its revenues amounted to £210.8 million ($375.1 million).

Around 41% of Sema's revenues came from France, 40% from Britain, 11% from West Germany, the Netherlands and Belgium, and 8% from Spain. The company's customers are primarily in the banking and finance sector (24% of revenues), industry (21%), defense and aerospace (15%), and nonfinancial services (10%). The energy, transportation and government sectors each accounted for 8% of revenues, with telecommunications chipping in 6%.

Apart from financial services, the British side of the firm specializes in software engineering and facilities management through its data networks subsidiary, which in November 1988 won a $63 million, five-year contract to manage the North American and European IS systems for Varity Corp., the holding company for engineering firm Massey-Ferguson.

In France, activities are centered on systems engineering and integration, as well as on control systems for atomic power stations. One of the most prestigious contracts won recently by this side of the house is a $15.5 million deal to computerize the 1992 Barcelona Olympics.

SD-SCICON PLC
Centrum House
101-103 Fleet Road
Fleet, Hampshire GU13 8NZ, U.K.
(44-252) 622161

95 A new entrant to the DATAMATION 100, SD-Scicon PLC is the result of the merger in April 1988 of two major British software

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and services companies—Systems Designers (SD) and Scicon International. SD, the smaller of the two firms, bought out troubled Scicon from its parent, British Petroleum Co. PLC, for £82.5 million ($147 million).

The resulting organization, with 1988 revenues of £221 million ($393 million), now ranks among the top three European services companies, with over 5,000 employees in 50 offices around the world.

Broken down by area of activity, the DP revenues of £205 million ($364 million) include professional consulting fees of £139 million ($247 million), hardware sales of £21 million ($37 million), and maintenance and other services of £45 million ($80 million).

The company's sector operations span communications, finance, energy, defense and aerospace, and government. Last year, three-quarters of SD-Scicon's revenues came from Europe, with over half of that coming from France and Germany. The United States contributed £51.5 million ($92 million).

In August 1988, the company's British operations were divided into two sectors of about 1,250 employees each. The SD offices now handle the government, defense and aerospace business, while Scicon deals with the commercial side—industrial, financial and energy.

Scicon Energy, which concentrates on large, complex computer systems, is the fastest growing part of Scicon in Britain. However, across the Atlantic, things are different. Last fall, SD-Scicon decided to sell off its Palo Alto-based energy systems group to Combustion Engineering of Stamford, Conn., for $12 million.

DATAPRODUCTS CORP.

6200 Canoga Avenue
Woodland Hills, CA 91365
(818)-887-8000

96 Shipments of Dataproducts Corp.'s line and laser printers heated up in mid-1989, and the company began to recover from its 1987 losses, despite an unusually big March 1988 quarter drop of $14.9 million. Although the company finished calendar 1988 with an $11.3 million loss, its last three quarters were profitable. Calendar 1988 revenues increased 9.1% to $364.5 million from $334.2 million.

The heavy loss in the March quarter—the last quarter in Dataproducts' fiscal year—was due chiefly to the $10 million the company incurred to move its serial printer business from New Hampshire to California to take advantage of more efficient manufacturing techniques. Another $6 million was a one-time charge against earnings from its decision to invest foreign earnings in the United States. The move is now paying off in higher interest earnings.

Together with the acquisition of Imaging Solutions Inc. of Brookfield, Conn. (the owner of a new technology called solid ink jet printing), these steps drew the attention of investors. DPC Acquisition Partners of New York City has been making acquisition overtures since last December, and DPC—ironically, the letters also make up Dataproducts' stock market trading symbol—now owns 7.7% of Dataproducts stock. Early this spring, the DPC investment group was threatening to initiate a tender offer for all of the company. Dataproducts has hired Goldman, Sachs & Co. to search for other buyers.

Hewlett-Packard's biggest single customer, the U.S. government, accounted for 5.9% of 1988 sales, down from 1987's 8.3%.

While the company claims that no final decision has been made to sell, Dataproducts has sent proprietary information about itself to U.S. subsidiaries of Hitachi Ltd. and Toshiba Corp. Japanese buyers were considered by analysts to be the most likely takers because the company would provide them with a direct channel to a larger U.S. corporate base.

DIEBOLD INC.

818 Mulberry Road S.E.
Canton, OH 44711
(216)-489-4000

97 Although Diebold Inc.'s revenues have been climbing slowly, competitive pressures have left earnings pretty flat for the last three years. DATAMATION estimates Diebold's 1988 sales of automatic teller machines (ATMs) at $362.8 million, up 5% over 1987's figures. Total corporate revenues hit $450.6 million, up 2.6% from 1987's $439 million. Profits are stuck at about $36 million, give or take a few hundred thousand. So the company is looking to turn more of its sales into profits. Early this year it laid off some 60 employees, reorganized the banking products marketing organization and planned to introduce new automation in its manufacturing systems.

Diebold plans to expand its international sales, which accounted for less than 10% of revenues in 1988. Diebold intends to keep R&D spending at about 4% of revenues—$18.4 million this year—a level it has maintained for the last three years. Analysts seemed to approve of the company's moves, especially its R&D spending levels, as new markets are expected to open in the automatic teller machine replacement field.

In a recent report, D.A. Zwyer of Kidder, Peabody & Co. Inc. said Diebold stands to be a major beneficiary of the coming resurgence in ATM orders with a projected 46% share of the ATM market. The bulk will be in the replacement market, where most banks have fully depreciated existing ATMs and are expected to be ordering new ones at the rate of some 19,000 units a year in the United States. The report says banks want new models to stimulate new business. Bank market studies show that only 15% of customers use ATMs on a regular basis.

ATARI CORP.

1196 Borregas Avenue
Sunnyvale, CA 94088
(408)-745-2000

98 If there are no second acts in great American success stories, then how does anyone explain the encore of Atari Corp.? Led by Jack Tramiel, who bought Atari in 1984 from Warner Communications Inc., the one-time video game king has emerged as a potent force in the low-cost PC arena. Last year, Atari sold $361.8 million in PCs, doubling its sales from 1986 and dwarfing the video game side of its business by a margin of four to one.

Atari's niche is the $2,000-and-under machine. In 1988, it introduced a laptop version of its 68030-based ST, the company's bread-and-butter machine. And in April of 1989, it brought out the Portfolio, a 4 × 8-inch, notebook-sized unit with an eight-line display. Atari has high hopes for the $800 Portfolio, with company officials likening its potential to that of the Commodore 64 in the mid-1980s.

But it won't come easily for Atari. In 1988, the company recorded an $84.8 million loss after writing off its disastrous foray into retail electronics. Since sales of VCRs peaked in 1986, consumer electronics stores in the United States have gone into a tailspin. Tramiel engineered the purchase of the Federated Group Inc. chain in 1987, hoping to turn around a money-losing operation and give Atari much-needed retailing exposure. Now analysts are wondering how Tramiel, who has a stellar record in such things, ever got involved with such a dog. Shaky, too, is Atari's video game business, in which Atari is contending with Nintendo, the phenomenally successful Japanese company that revived the business Atari once called its own.

As if all that weren't enough. Atari estimates it lost nearly $100 million in sales because of a shortage of memory chips in 1988.

MICROPOLIS CORP.
21211 Nordhoff Street
Chatsworth, CA 91311
(818)-709-3300

99 Micropolis Corp., which reported a profit of $27.3 million in 1987, last year lost $19.4 million. For the designer and manufacturer of disk drives, the bad news was the ironic result of a hot-selling product.

In 1988, Micropolis' most unprofitable product—the 1550 series 380 megabyte 5¼-inch disk drive—nearly doubled in popularity, accounting for around 40% of sales. While Micropolis has been working feverishly to cut the cost of manufacturing the 1550, at one time during 1988 it was losing from $200 to $300 on every one it shipped at a price of $1,300. For example, in the third quarter, its sales of that disk drive soared to $40 million from $22.5 million in the second quarter. In addition, sales of a very profitable 170MB drive began to fade—from $50 million in the second quarter to $38 million in the third.

Nevertheless, Micropolis' good (or is it bad?) luck with the 380MB device was a big contributor to a 1988 sales increase to $353 million, from $288.32 million the year before. And analysts think the current downward cycle in disk drive business has reached bottom. "The road back to acceptable levels of profitability will be difficult and lengthy for most companies," says analyst John C. Furlan of San Francisco-based Montgomery Securities.

To cut costs, Micropolis has shifted from thin-film heads to less expensive composite heads. It reduced employment 40% last year by shifting 90% of its labor content to Singapore and also by transferring subassemblies from Singapore to Thailand.

The company got breathing room early this year by negotiating a $20 million short-term bank line of credit. And it has some new products this year: a half-height 180MB and a half-height 380MB drive, a full-height 760MB drive and a 3½-inch 200MB drive. Analysts think these products could contribute about $60 million to revenues, but add that Micropolis will probably have to wait until year end to become profitable.

EASTMAN KODAK CO.
343 State Street
Rochester, NY 14650
(716)-724-4000

100 Eastman Kodak Co. jumped on the UNIX and open systems bandwagon in 1988, acquiring Interactive Systems Corp., a 12-year-old UNIX software and services company.

Founded in 1977, Interactive offered the first commercially supported version of UNIX and was the firm that developed a version of UNIX for IBM's AT. With annual sales of $55 million, the company stands as the cornerstone in Kodak's newly formed Software Systems Division. It should also bring some standardization to Kodak's various IS activities. These activities include optical disk systems, the ATEX publishing system and Kodak Information Management Systems, all of which are currently based on proprietary architectures.

Interactive Systems is one of a string of recent acquisitions by Kodak in the information business. Others include Yourdon Inc., a consulting, training and software development firm; Aquidneck Corp., specializing in software development for the federal government; and, in February 1989, Lachman Associates Inc., another UNIX software company, now folded into Interactive Systems.

IS-related products and services accounted for some $350 million in revenues at Kodak in 1988, only about 2% of the company's overall $17 billion in sales. More than half of Kodak's IS revenues are generated by Verbatim Inc., which makes computer disks. The big news at Verbatim in 1988 was its successful petition to the U.S. International Trade Commission, a petition in which it charged Japanese firms with dumping floppy disks on the U.S. market.

The company profiles in this issue were written by 20 DATAMATION bureau managers, editors and correspondents. Profiles of the U.S.-based companies are by Eric Brand, Ralph Emmett Carlyle, Marsha J. Fisher, Robert Francis, Parker Hodges, Joseph Kelly, Susan Kerr, Tom McCusker, Gary McWilliams, Jeff Moad, Willie Schatz and David Stamps. Profiles of the European-based companies were written by Tina Esh, James Etheridge, Janette Martin, Boris Sedacca and Peggy Trautman. Profiles of Asian-based companies were written by Stuart Dambrot, Oles Gadacz and Claudia Nalven. The profiles were edited and the data gathered by Marsha J. Fisher, Parker Hodges, Joesph Kelly, Gary McWilliams, Lauren Murphy and Paul Tate.

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THE DATAMATION 100

Inside The Markets

Analyses of eight key IS market sectors: mainframes, minis, micros, software, services, peripherals, data com and maintenance.

The DATAMATION 100 surveys the financial results of technology vendors: MIS's hard currency response to the offerings of information systems vendors worldwide. The next section delivers a different view. In these pages, trend spotters from eight top information research houses analyze the forces shaping eight basic IS market segments: mainframes, minicomputers, microcomputers, peripherals, software, data communications, information services and maintenance.

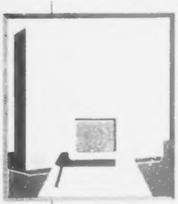
Realism, not blue-sky musing, marks the views of these technology watchers. They tell what's up, what's down, who's got it and who's missed the boat in each of the markets—markets in which IS executives make crucial choices.

Here, then, is a quick guide to the technologies essential for running today's businesses and to the vendors that sell these technologies. The mainframe sector is discussed by Steven Milunovich of First Boston Corp.; minicomputers by Stephen K. Smith of Paine Webber Inc.; microcomputers by Virginia Ewell of The Yankee Group; maintenance by Doug McLeod of the International Data Corp.; peripherals by Greg Blatnik, Jim Upham and Phil Devin of Dataquest Inc.; software by Michael Braude of Gartner Group; information services by Robert L. Goodwin of Input; and data communications by Kim Myhre of Cahners Business Research Group. Each of the Technology Insights includes a table showing the 15 leading vendors in the market sector being discussed. The tables also show each vendor's position in the world ranking of the DATAMATION 100, and give each vendor's revenues in the market sector. ☐

IBM Solid, Amdahl Soars, NAS Limps And Unisys Faces Transition

BY STEVEN MILUNOVICH

As IBM mainframe chief Carl Conti said recently, "Read my MIPS—the mainframe is not a dinosaur." Results in 1988 backed him up: mainframe sales were solid worldwide and particularly strong in Europe and Japan. IBM maintained its lock on the big box market with the 3090 series, but Amdahl Corp. managed to gain share for the third consecutive year.



The mainframe's roles as a data base and network manager became more evident. And IBM's introduction of Enterprise Systems Architecture (ESA) assured the mainframe's place in enterprise management in coming years.

Although IBM long ago won the mainframe war, skirmishes continue. Given that IBM's 3090 was announced in 1985, a second consecutive year of double-digit revenue gains for the 3090 was an impressive feat in 1988. Still, IBM's mainframe sales growth may decelerate during 1989-1990, as the next generation Summit will not even be announced until third-quarter 1990. Furthermore, the IBM/Fujitsu arbitration ended with Fujitsu Ltd. paying IBM for the right to have a reasonable opportunity to independently develop and maintain IBM compatibility.

The plug-compatible vendors experienced a mixed year in 1988. Amdahl scored by preempting IBM's 3090S with its 5990 in May. Amdahl's 5990 was the first to break the 100MIPS barrier, beating the July-announced IBM 3090S by two months. The 5990 took the giant by surprise, perhaps even forcing IBM's 3090S hand, which may have led to the logic chip production problems IBM has encountered. National Advanced Systems Inc., however, fell behind in the performance race, unable to come up with partitioning capabilities similar to those provided by Amdahl's Multiple Domain Feature and IBM's PR/SM products.

Other high-end players also had a rough time. Unisys Corp. entered a period of product transition on the Sperry side of the house, in the process depressing shipments. But the new 2200, replacing the successful 1100 line, is now in delivery. Control Data Corp.'s Cyber business continued to suffer as new competitors in the scientific arena nipped at the company's heels and chip delays held back deliveries of new systems. Cray Research Inc.'s growth was slowed by the transition to the Y-MP and surprising demand for smaller, less profitable supercomputers. Siemens AG's mainframe sales were about flat, as U.S. companies gained a bigger piece of the European pie. Bull HN came battling back, however, with its new NEC Corp.-sourced DPS 9000, offering the world's fastest uniprocessor at a breathtaking 40MIPS.

IBM considers its MVS/ESA operating system to be a major technological breakthrough, and Big Blue expects it to take its place as the architectural platform of the 1990s. ESA expands addressability to 16 gigabytes and provides automatic storage management through the Data Facility Storage Management Subsystem (DFSMS). MVS/ESA and DFSMS running on the 3090S models offer 52% more Customer Information and Control System (CICS) transactions, a 120% improvement in DB2 queries and 20% better disk utilization.

Unisys also responded with its Extended Transaction Processing Architecture (XTPA) for the 1100/2200. Unisys benchmarks yielded a rate of 5,000 transactions per second by closely coupling up to four processors to one data base. Cray spent 45% of its research and development funds last year on software, coming up with Autotasking, an automatic parallel-processing capability that can provide up to eightfold increases in computation speed. Finally, vendors are testing the UNIX waters with supercomputer offerings from Cray and Control Data's ETA Systems subsidiary, as well as mainframe UNIX versions from Amdahl and IBM.

The competition could get even tougher at the high end for two reasons. First, companies like Digital Equipment Corp. are being forced to enter the mainframe market to find revenue to support their cost structures. This could invoke another shakeout similar to when General Electric Co., RCA Corp. and Xerox Corp. exited the business in the 1970s. Second, microprocessor-based systems may eventually pressure the mainframe from below just as stand-alone minicomputers are being shunted aside today. The mainframe companies' success in solution selling and enterprise management through approaches like IBM's Systems Application Architecture will determine big iron's contribution in 1989 and years to come.

Steven Milunovich is a director of First Boston Corp.

The Top 15 in Mainframes

The Japanese proved in 1988 that there's still plenty of life in the mainframe business—and so did Amdahl and Comparex.

	DTM 100 RANK	COMPANY	MAINFRAME REVENUES 1988 ($MIL.)	1987 ($MIL.)	% CHANGE*	MARKET SHARE†
1	1	**IBM**	12,138.8	11,193.0	8.45	40.1
2	3	**Fujitsu**	4,184.9	3,318.2	26.12	13.8
3	4	**NEC**	4,033.1	3,082.0	30.86	13.3
4	6	**Hitachi**	2,507.3	1,850.4	35.50	8.3
5	28	**Amdahl**	1,225.2	926.2	32.28	4.0
6	5	**Unisys**	1,175.0	1,322.0**	(11.12)	3.9
7	11	**Groupe Bull**	901.0	844.0**	6.75	3.0
8	8	**Siemens**	683.4	695.5	(1.74)	2.3
9	22	**STC**	658.4	596.8	10.32	2.2
10	64	**Cray Research**	632.9	588.3	7.58	2.1
11	16	**Control Data**	465.0	510.0	(8.82)	1.5
12	25	**Nihon Unisys**	384.8	226.9	69.59	1.3
13	51	**National Semiconductor**	372.0	362.0	2.76	1.2
14	73	**Comparex**	239.7	133.0	80.23	0.8
15	10	**NCR**	218.3	200.3	8.99	0.7

*In local currency, Fujitsu's mainframe revenues were up 11.8% to ¥536.3 billion, NEC's were up 16% to ¥516.8 billion, Hitachi's were up 20.1% to ¥321.3 billion, Groupe Bull's were up 5.8% to Fr5.4 billion, Siemens' were down 4% to DM1.2 billion, STC's were up 1.4% to £370, Nihon Unisys' were up 50.3% to ¥49.3 billion and Comparex's were up 76.2% to DM421.0

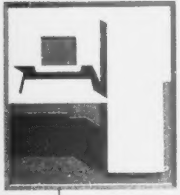
**Restated figures for 1987

†Percentage share of DTM 100 mainframe revenues

☐ THE AS/400 AND OLTP HEAT UP COMPETITION IN A REVIVING MARKET

BY STEPHEN K. SMITH

Ads for minicomputers on TV? Tiny MAI Basic Four Inc. buying Prime Computer Inc.? IBM's John Akers, Digital's Kenneth Olsen and Hewlett-Packard Co.'s John Young on the same stage (at the Open Systems Foundation launch) and apparently on the same side? IBM with a hot minicomputer product? Apple Computer Inc. and Digital teaming up? HP and 3Com Corp.? If 1988 was anything to go by, 1989 looks like an interesting year for the minicomputer vendors.



While major weekly business publications were again writing the minicomputer's obituary, IBM's AS/400 exceeded just about every industry watcher's forecast. IBM did enough with AS/400 to maintain its loyal S/3X base, although questions remain about whether or not small-business users really want or need the prowess of Systems Application Architecture (SAA) or Systems Network Architecture (SNA). However, because of the enormous demand from within its base (IBM shipped 25,000 units in the latter part of 1988), IBM has not priced the AS/400 overly aggressively. Nevertheless, the machine poses a long-term challenge to Digital and HP.

Even before IBM introduced the AS/400, Digital's growth rate had hit the skids. The problem was all at the high end, with the aging and expensive 8800 line. Since a six-processor 6360 (announced in January 1989) offers performance equivalent to the current top-of-the-line 8840 at about half the price, the 6200 and more recent 6300 have all but killed off the 8800 for Digital.

To help solve this problem, by early 1989, the entire VAX family (with the exception of the forthcoming Aridus mainframe) had been transferred to microprocessor technology. In another big move, Digital claims it has improved the performance of its VAX computers in addressing OLTP applications by a factor of 10. Most significant was the dramatic fivefold improvement in the performance of its relational data base product, Rdb, now bundled in with the VMS operating system. Even so, don't expect Digital to make major headway in OLTP for another year or so, when it introduces the long-awaited Aridus.

While there is room for both Tandem Computers Inc. and Digital in the non-IBM OLTP market, Digital is still two to three years behind Tandem. Tandem has a broad range of applications, a strong OLTP base and credibility in a market in which credibility is vital. Recent product introductions include NonStop structured query language (SQL), which provides compatibility with IBM's Database 2 (DB2), but with major (up to threefold) price/performance advantages and superior functionality (fault-tolerant, distributed capabilities).

Hewlett-Packard finally turned the corner with its Spectrum product line in 1988. The August release of MPE 1.1 minicomputer operating system was a key factor. Performance and reliability concerns now appear to be behind the company. Hewlett-Packard saw a large increase in orders for its commercial Spectrum machines from the third to the fourth quarter, but it will likely be a while before Spectrum makes a more noticeable impact on this $10 billion company.

Data General Corp. president Edson de Castro's goal is to turn that company into the leader in open systems. Data General is introducing a whole line of products based on Motorola Inc.'s 88000 RISC chip, although those products are unlikely to have significant revenue impact until fiscal year 1990. DG—like the remaining second-tier players—must attract software to its new open platform if it is to compete on the basis of function as well as on price.

For the first time in years, Wang Laboratories Inc. has introduced competitive products in a timely fashion at the low end (VS5000) and high end (VS10000). A complete product overhaul is expected by year's end, including a new midrange model (Merlin). These new products appear to be getting a much better reception from Wang's customers than some of the company's earlier introductions did, like the ill-fated VS 300. The key to Wang's future is whether it can use imaging and PC-based applications, such as Freestyle, to leverage VS hardware sales.

The battle over UNIX will determine who controls the development of a commercial version of the operating system. From a user standpoint, the issue is as clear as mud. Will the Open Systems Foundation and UNIX International make friends in 1989? Odds are slim: users are going to have to wait a lot longer before key UNIX issues are resolved. ☐

Stephen K. Smith follows computers for Paine Webber Inc.

The Top 15 in Minis

Workstations propelled Sun to the top ranks, while Digital cooled down and Wang went flat again.

	DTM 100 RANK	COMPANY	MINICOMPUTER REVENUES 1988 ($MIL.)	1987 ($MIL.)	% CHANGE*	MARKET SHARE†
1	1	**IBM**	4,400.0	4,000.0 **	10.00	18.2
2	2	**Digital Equipment**	3,735.6	3,248.4	15.00	15.5
3	7	**Hewlett-Packard**	1,500.0	1,221.0	22.85	6.2
4	37	**Sun Microsystems**	1,096.2	566.9 **	93.37	4.5
5	13	**Toshiba**	1,092.1	919.6	18.76	4.5
6	5	**Unisys**	1,080.0	1,125.0 **	(4.00)	4.5
7	3	**Fujitsu**	991.2	804.3	23.24	4.1
8	17	**Wang**	912.1	909.3	0.31	3.8
9	25	**Nihon Unisys**	658.5	400.1	64.58	2.7
10	34	**Prime**	626.7	387.0	61.94	2.6
11	9	**Olivetti**	614.3	603.9	1.72	2.5
12	38	**Tandem Computers**	557.0	472.8	17.81	2.3
13	44	**Mitsubishi**	490.5	403.3	21.62	2.0
14	18	**Nixdorf Computer**	484.1	466.6	3.75	2.0
15	11	**Groupe Bull**	477.0	446.8 **	6.76	2.0

*In local currency, Toshiba's mini revenues were up 5.2% to ¥139.9 billion, Fujitsu's were up 9.2% to ¥127 billion, Nihon Unisys' were up 45.8% to ¥84.4 billion, Olivetti's were up 2.1% to L799.6 billion, Mitsubishi's were up 7.8% to ¥62.9 billion, Nixdorf's were up 1.4% to DM850 Groupe Bull's were up 5.8% to Fr2.8 billion

**Restated figures for 1987

†Percentage share of minicomputer revenues

☐ A COLLISION BETWEEN POWERFUL PCs AND LOW-COST WORKSTATIONS

**BY VIRGINIA EWELL
and YANKEE GROUP STAFF**

By the end of 1989, we will have had our first real view of the race between the traditional workstation and PC vendors. While the cost of workstation products and platforms from companies such as Apollo Computer Inc., Hewlett-Packard Co., Mips Computer Systems Inc. and Sun Microsystems Inc. has been dropping, the performance power of the PCs from Apple Computer Inc., COMPAQ Computer Corp., Dell Computer Corp. and IBM has been increasing. Two markets are now vying for the middle ground.

The traditional PC platforms from Intel Corp. and Motorola Inc. have brought a significant power increase with their new chips, the 80486 and the 68030, respectively. The 80486 is designed to yield two to three times the performance of the 80386, with full binary compatibility with the 80X86 MS-DOS environment. The 68030 is targeted to yield 7 million instructions per second (MIPS) and improve throughput, thanks to an on-chip Memory Management Unit, data cache and address cache, as well as a dual-address bus and data bus.

In the RISC-based workstation arena, there are the SPARC-based processors from Fujitsu Ltd. and Sun, the Intel 80860, the Mips R3000 and the Motorola 88000. As a result of these chip advances, the workstation market delivers the same power and product at reduced cost, and the PC market delivers a more powerful product at the same cost as existing PCs. Sooner or later, these markets are going to have to meet.

What will this collision mean? First, customers will buy what they are most comfortable using. Those who are comfortable and happy with MS-DOS will not likely hop on the UNIX bandwagon. Second, PCs and workstations have different strengths and weaknesses. But, as they compete with one another, each will improve by absorbing the better techniques and features of its rival.

Who is the customer for high-end PCs? These users will be professionals, using their machines primarily for highly interactive, ad hoc access to enterprise-level information and graphics-intensive applications.

The application technologies that will drive this advanced user include those involving compound document architectures, next-generation network computing and computer-mediated work group technology. These three application technologies allow team members to function as a cohesive unit.

Hewlett-Packard is clearly positioning itself to benefit from this new trend. When it fulfills its announced plan to acquire workstation vendor Apollo, HP can field a solid workstation line based on several underlying processors. Combined, the workstation market share of Apollo and HP surpasses both that of Digital and Sun. Meanwhile, Sun also is undergoing a remarkable shift. Just as Apple charges headlong into the corporate computing world with a battle cry of "The computer for the rest of us," Sun has now adapted the phrase, "The UNIX for the rest of us."

But don't count Digital out of this new desktop market. By the end of 1991, The Yankee Group believes workstations will be Digital's second-largest revenue producer. Nevertheless, the Maynard, Mass., giant is temporarily on the defensive, and it must scramble if it is to overcome its increased vulnerability to rivals Sun and HP.

Although the movement was originally inspired by Apple's flagship product, the Macintosh, Apple will struggle to maintain momentum in this new era of desktop computing. But Apple knows the location of the target and is willing to speculate that the PC/workstation will be operating at 100MIPS within five years.

IBM has split its desktop initiative between its Advanced Workstation Division and its Entry Systems Division. While IBM's two-pronged approach may very well succeed in the long run, it is a dangerous one in the short term: the company's dual focus could result in an ever-widening divergence, when the desktop market itself is converging.

The future of the traditional PC world will be consumed with debates concerning UNIX versus OS/2 versus DOS and MicroChannel versus Extended Industry Standard Architecture (EISA). The indicator in the operating systems war will be the positions taken by major software developers. Watch who is porting to UNIX versus OS/2. Then watch what happens with sales. Right now, DOS is winning. Even those who port to UNIX will maintain DOS as a cash cow. ▭

Virginia Ewell is director of distributed systems research at The Yankee Group in Boston.

The Top 15 in Micros

Apple, Compaq and Zenith continued to soar in 1988, but Tandy and Amstrad couldn't keep up.

	DTM 100 RANK	COMPANY	MICROCOMPUTER REVENUES 1988 ($MIL.)	1987 ($MIL.)	% CHANGE*	MARKET SHARE†
1	1	IBM	7,150.0	6,500.0 **	10.00	25.5
2	12	Apple	2,950.0	2,069.0	42.58	10.5
3	24	Compaq	2,065.6	1,224.0	68.76	7.4
4	9	Olivetti	1,427.5	1,176.0	21.39	5.1
5	29	Tandy	1,232.2	1,132.2	8.83	4.4
6	39	Zenith	1,220.4	936.0 **	30.38	4.4
7	4	NEC	1,204.7	933.2	29.09	4.3
8	13	Toshiba	1,083.4	800.0	35.43	3.9
9	5	Unisys	1,050.0	732.0 **	43.44	3.7
10	59	Amstrad	784.0	685.3 **	14.40	2.8
11	7	Hewlett-Packard	670.0	499.0	34.27	2.4
12	21	AT&T	630.0	540.0	16.67	2.2
13	54	Commodore	601.1	514.3	16.88	2.1
14	3	Fujitsu	595.3	463.3	28.49	2.1
15	14	Matsushita	585.0	436.8	33.93	2.1

*In local currency, Olivetti's micro revenues were up 21.8% to L1.9 trillion, NEC's were up 14.4% to ¥154.4 billion, Toshiba's were up 20% to ¥138.8 billion, Amstrad's were up 5.1% to £440.6 million, Fujitsu's were up 13.8% to ¥76.3 billion, Matsushita's were up 18.7% to ¥75 billion

**Restated figures for 1987

†Percentage share of DTM 100 microcomputer revenues

DOWNSIZING, RELIABILITY AND INNOVATION CHANGE THE GAME

BY DOUG McLEOD

Competitors in the increasingly fierce $12 billion U.S. computer hardware maintenance and $1 billion data communication maintenance markets are playing a new game. Downsizing, increasing reliability and innovative maintenance technologies are changing the rules. Service providers are seeing traditional hardware services revenue shift toward a host of "soft" services, offered by an aggressive, market-driven IBM and more savvy third-party maintainers. These factors are resulting in a transfer of negotiating leverage away from vendors and toward buyers of computer services. IBM's growing willingness to listen and respond to customers' service needs is forcing other service vendors to offer competitive, aggressively priced programs. Growing by 4%, and by over 100% in workstation and PC arenas, the hardware maintenance market is one in which the only constant is change.

With a greater number of applications migrating to local area network (LAN) and PC-based platforms, service revenue growth for all but low-end systems has become almost flat. Mainframe service growth will continue to creep up. While downsizing will stimulate midrange equipment sales, intense competition in the midrange service markets will result in smaller maintenance revenue and growth. Increasing reliance by vendors and users alike on dealers, which sell a greater proportion of PC and LAN solutions, is forcing manufacturers to develop shared responsibility dealer service strategies, a daunting task that presupposes loss of account control.

In addition, the increasing reliability of hardware components and major vendors' renewed aggressiveness have spawned the emergence of commodity markets for repair services in major cities. As a result, providers are diversifying into related services, such as software support, disaster recovery and network support. Because the company servicing the network controls the network, it's no surprise that within the past 12 months no fewer than a dozen major hardware manufacturers have announced their intention to become "major" network services suppliers. As remedial hardware maintenance revenues fall, service profit centers will continue to diversify into related areas.

To survive, providers must offer and deliver well-defined services for a specified range of products. This need to focus is engendering previously unheard of partnerships. For example, LAN rivals Novell Inc. and 3Com Corp. both now count Hewlett-Packard Co. as a major service partner. Third-party maintainers also have been forced to execute careful cost-benefit analyses by product line to assure the ongoing profitability of their service programs and products. They are focusing on vertical market niches: Sorbus Inc.'s four acquisitions are all depot repair firms offering high levels of very specific expertise with low overhead.

Responding to long-standing criticism, in January, IBM announced a new service-ordering firm to simplify the complex process of signing up for IBM programs. Under the ServicePlan umbrella, users can order services such as network support, customized relocation services and an estimated-billing option that simplifies service tracking and management in larger accounts. HP is rolling out a new class of service—multivendor support—which aims to minimize vendor finger-pointing by providing a single service vendor contract. Digital has hinted at a similar forthcoming announcement.

In the face of declining revenues in traditional service areas, vendors are introducing products with telecommunications services and built-in predictive maintenance capabilities designed to increase customers' self-sufficiency without losing customer satisfaction. Third parties are providing standalone AI diagnosis and repair systems geared toward end users and field engineers.

The net result of widespread multisourcing of hardware maintenance is a shift in control of the negotiation process from service vendors to users. Users are demanding guaranteed uptime with penalty clauses and unheard of flexibility in their negotiations with service vendors. Others are requiring vendors to participate in innovative billing solutions that provide precise levels of support for different installations and equipment, depending on criticality. Vendors are finding that simply supplying well-trained technicians on a timely, professional basis is no guarantee of a successful, or profitable, service business. ▭

Doug McLeod is senior analyst of network and communications support for International Data Corp.

The Top 15 in Maintenance

Competition and price cutting kept maintenance revenues down in 1988.

	DTM 100 RANK	COMPANY	MAINTENANCE REVENUES 1988 ($MIL.)	1987 ($MIL.)	% CHANGE*	MARKET SHARE†
1	1	**IBM**	7,347.0	7,691.0	(4.47)	25.7
2	2	**Digital Equipment**	3,882.3	3,086.8	25.77	13.6
3	5	**Unisys**	1,971.0	1,952.0	0.97	6.9
4	10	**NCR**	1,678.6	1,556.0	7.88	5.9
5	11	**Groupe Bull**	1,374.7	1,290.8	6.50	4.8
6	3	**Fujitsu**	1,006.3	799.9	25.80	3.5
7	7	**Hewlett-Packard**	980.0	800.0	22.50	3.4
8	8	**Siemens**	968.1	1,001.5	(3.33)	3.4
9	9	**Olivetti**	929.6	820.4	13.31	3.3
10	17	**Wang**	829.4	822.3	0.86	2.9
11	6	**Hitachi**	742.3	639.6	16.06	2.6
12	34	**Prime**	560.0	318.7	75.71	2.0
13	42	**Data General**	450.2	435.0	3.49	1.6
14	19	**NV Philips**	417.3	385.1	8.36	1.5
15	23	**Memorex Telex**	417.1	198.0	110.9	1.4

*In local currency, Groupe Bull's maintenance revenues were up 5.6% to Fr8.2 billion, Fujitsu's were up 11.5% to ¥128.9 billion, Siemens' were down 5.6% to DM1.7 billion, Olivetti's were up 13.7% to L1.2 trillion, Hitachi's were up 2.8% to ¥95.1 billion, Philips' were up 5.8% to G825 million and Memorex Telex's were up 105.6% to G824.6

†Percentage share of DTM 100 maintenance revenues.

☐ TWEAKS IN A MATURE TERMINAL MARKET, TROUBLE IN DISK DRIVES

BY GREG BLATNIK, JIM UPHAM AND PHIL DEVIN

The display terminal industry experienced a turbulent 1988. Although U.S. shipments grew about 3% over 1987 to 2.87 million units, not all participants enjoyed the market growth. Many factors contributed to uneven performance. The industry's leaders, AT&T, Digital Equipment Corp., Hewlett-Packard Co., IBM, Memorex Telex Corp. and Wyse Technology employed a variety of strategies to increase their market presence.

The leading vendors have used their economies of scale to achieve lower costs and better margins than their competitors. Each has invested heavily in company-controlled automated manufacturing facilities in the U.S. or in Asia.

However, many vendors faced mounting challenges in 1988, primarily caused by offshore manufacturing choices. The cost advantages of low-volume Asian manufacturers of display terminals is evaporating. Vendors are scurrying to line up new manufacturers, and some are moving manufacturing back to the U.S.

The display terminal is a mature product, and very few technological breakthroughs are expected. Dataquest Inc. expects a trend toward better display quality: higher refresh rates, overscan and higher resolution. We are seeing more and more vendors introduce terminals with local-processing capability, usually with built-in network interfaces for use in place of PCs on local area networks.

Other technological trends include increased use of standard and custom very large scale integration (VLSI) chips to reduce chip count, improve reliability and add unique features. Many products are expected to incorporate bit-mapped displays, as windowing and graphical user interfaces become common in applications. Dataquest expects an increasing use of terminals on LANs, further improvement of display quality and input methods and a growing market for terminals that support the X Windows System.

One of the most dynamic areas in the electronic printer industry is the low-end page printer market. In the U.S., this market has seen a growth in unit sales from its effective introduction in May 1984 to almost 1 million units in 1988.

From the simple beginnings of custom software drivers and basic hardware configurations, the low-speed desktop page printer industry has gone through a "big bang" expansion, creating galaxies of configurations and price levels centered around page description language preferences, CPU environments and application compatibilities. The result is over 200 companies offering different printer configurations, memory or controller boards, paper-handling and printer-sharing devices, and applications and font software development.

Hewlett-Packard, in conjunction with Canon Inc., has taken the initial lead in the less-than-10-pages-per-minute segment of the market, with Apple Computer Inc. coming in at number 2 (again with a Canon printer engine). All other printer manufacturers and resellers have had to target either a share of the leaders' established segments or a separate segment differentiated by price or function.

The top rigid disk drive vendors found 1988 a tough year to maintain growth in sales and profits. Big capital infusions in 1987 set the industry off on a binge of factory expansions in order to meet an anticipated demand of 17 million disk drives in 1988. But, instead of the anticipated 70% sales growth, consumers bought at a rate in excess of only 40% over 1987 rates.

Seagate Technology was the first to fess up to the situation in its second calendar quarter report. Micropolis Corp. was the next to report losses and full inventories. Miniscribe Corp.'s problems were first noticed at the end of December 1988 and may turn out to be severe.

Public companies reporting continued growth despite this trouble were Control Data Corp.'s Imprimis, Conner Peripherals, Maxtor and Quantum Corp. Maxtor and Imprimis are well entrenched in the high-capacity, high-performance, high-profit OEM business. Conner and Quantum both court the high end of the laptop market, as well as the graphics-oriented desktop business.

Dataquest looks for continued growth in the 3½-inch hard disk market and a move toward high-capacity, high-performance drives in the 5¼-inch arena. The 8-inch drives are encroaching on the 14-inch installed base, and watch for arrays of small diameter products to supplant their larger predecessors. ▭

Greg Blatnik, Jim Upham and Phil Devin follow the peripherals market for Dataquest Inc. of San Jose, Calif.

The Top 15 in Peripherals

Hot-selling laser printers propelled Hewlett-Packard, Canon and Apple, but the figures don't show what a difficult year it was at Seagate.

	DTM 100 RANK	COMPANY	PERIPHERALS REVENUES 1988 ($MIL.)	1987 ($MIL.)	% CHANGE*	MARKET SHARE†
1	1	IBM	10,700.0	9,661.0 **	10.75	17.6
2	6	Hitachi	3,917.6	3,036.2	29.03	6.5
3	2	Digital Equipment	3,166.2	2,764.7	14.52	5.2
4	4	NEC	2,828.4	2,270.1	24.59	4.7
5	3	Fujitsu	2,728.5	2,164.0	26.09	4.5
6	7	Hewlett-Packard	2,250.0	1,735.0	29.68	3.7
7	10	NCR	1,872.0	1,808.4	3.52	3.1
8	20	Xerox	1,725.0	1,560.0	10.58	2.8
9	14	Matsushita	1,582.9	1,185.1	33.57	2.6
10	8	Siemens	1,566.1	1,502.3	4.25	2.6
11	15	Canon	1,382.1	878.0	57.41	2.3
12	40	Seagate Technology	1,351.0	1,075.7	25.59	2.2
13	12	Apple	1,350.0	900.0	50.00	2.2
14	23	Memorex Telex	1,339.1	681.6	96.46	2.2
15	11	Groupe Bull	1,325.0	1,241.2 **	6.75	2.2

*In local currency, Hitachi's peripherals revenues were up 14.3% to ¥502 billion, NEC's were up 14.3% to ¥362.5 billion, Fujitsu's were up 11.7% to ¥349.7 billion, Matsushita's were up 18.3% to ¥202.8 billion, Siemens' were up 1.8% to DM2.7 billion, Canon's were up 39.5% to ¥177.1 billion, Memorex Telex's were up 91.7% to G2.6 billion, Groupe Bull's were up 5.8% to FF7.9 billion, Nixdorf's were flat at DM2.2 billion

**Restated figures for 1987

†Percentage share of DTM 100 peripherals revenues

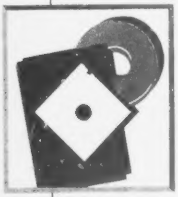
TECHNOLOGY INSIGHTS

SOFTWARE

☐ PROPRIETARY OSs LOSE CLOUT, ORACLE AND RELATIONAL GAIN

BY MICHAEL BRAUDE

Among the major software trends prefigured by 1988 results will be the growth of relational data base management systems (DBMS) based on Structured Query Language. The dominance of this trend is the result of two deeper forces: irresistible pulls toward standards and also toward open architectures. SQL promises users independence from any particular DBMS or vendor and offers compatibility with IBM's strategic directions. Oracle Corp., Relational Technology Inc. (RTI) and Sybase Inc. are the main beneficiaries of this trend; IBM, Stratus Computer Inc. and Tandem Computers Inc. will benefit to a lesser extent. However, Cullinet Software Inc., Software AG of North America Inc. and Computer Corp. of America Inc. will be on the wrong side of this trend for some time.



Gartner Group projects that proprietary operating systems environments (excluding Digital and IBM) will diminish in market revenue share from 40% in 1987 to 28% in 1992. That 28% will amount to $47 billion, still a respectable target. Long before 1992, the vendors of small systems will adopt UNIX as the prime means of attracting customers.

Increasing prominence is being given to mission critical applications supporting the generation of both revenue and competitive advantage. These mission critical applications are intolerant of power outages, require subsecond response times, must be easy to use and changed quickly and need to operate across disparate platforms. Few existing applications meet these criteria.

Corporate users want to establish distributed-processing networks that can leverage their huge host-based investments in workstation technology and can also combine those machines with minicomputers. Such networks offer the promise of partially enabling mission critical applications. They also may provide a computing architecture that can adapt to streamlined corporate structures. The software vendors that maintain strong financial momentum all exploit this downsizing trend and support some measure of cooperative processing.

A successful player must also have a well-tuned distribution strategy and must find new products to pump through its distribution channel. It must leverage its installed base for revenues and for guiding new product directions.

Computer Associates International Inc. is hot largely because it best exploits these dynamics. While Computer Associates is a vendor of mainframe system software products, it now also dominates the market for PC-based small-business accounting software, as well. Gartner Group expects Computer Associates' growth to continue—reaching $1.35 billion in the 1989 calendar year.

Of all the players, Oracle best exploits standards, open architectures and the downsizing trend. Among the independents, it is second only to Computer Associates in marketing clout. Oracle's customers are receptive to its higher level initiatives, such as CASE, office systems and applications.

Relational Technology, if not exactly hot, is at least warm, pulling out of Oracle's shadow via two clever initiatives: focusing on tool interoperability (through deals with Digital and Tandem) and embedding its Ingres DBMS deeply into key firmware and operating systems.

Sybase was the first relational vendor to offer OLTP capability, an area in which it still leads. Under pressure from Oracle and Relational Technology, Sybase unveiled a new tools strategy in late 1987 and continued its differentiation via a well-presented security capability.

Major mainframe applications software vendors—Hogan Systems Inc., Management Science America Inc. and McCormack & Dodge—were all once highly profitable. But mainframe growth slowed (from 45% MIPS growth per year to an estimated 35% in 1988). A second problem is that the application software vendors must maintain large direct sales forces that have substantial knowledge of the markets into which they sell. This precludes a strategy of gradually adding products (except extensions) without increasing sales and support staff.

Microsoftware vendors (Ashton-Tate, Lotus Development Corp. and even Microsoft Corp.) do not yet understand how quickly they must grow in software sophistication. If these vendors could fathom the system management and productivity problems in large shops, they might use their large cash hoards to leverage desktop ownership into upstream prominence. Unless that transition is made, these firms may suffer. ▭

Michael Braude follows software for Gartner Group.

The Top 15 in Software

The big news in 1988 was the astounding growth of Oracle and the slowdown at Lotus.

	DTM 100 RANK	COMPANY	SOFTWARE REVENUES 1988 ($MIL.)	1987 ($MIL.)	% CHANGE*	MARKET SHARE†
1	1	IBM	7,927.0	6,836.0	15.96	38.5
2	4	NEC	890.4	676.0	31.72	4.3
3	5	Unisys	875.0	875.0 **	0.00	4.2
4	2	Digital	794.6	691.1	14.98	3.9
5	55	Computer Associates	705.4	497.6	41.76	3.4
6	3	Fujitsu	676.1	515.9	31.05	3.3
7	8	Siemens	626.4	550.8	13.73	3.0
8	66	Microsoft	610.8	397.3	53.74	3.0
9	6	Hitachi	602.1	448.8	34.16	2.9
10	11	Groupe Bull	583.0	546.1 **	6.76	2.8
11	7	Hewlett-Packard	500.0	415.0	20.48	2.4
12	82	Lotus	438.5	380.6 **	15.21	2.1
13	90	Oracle	424.6	198.0	114.44	2.1
14	18	Nixdorf	418.6	405.8	3.15	2.0
15	9	Olivetti	414.4	347.9	19.11	2.0

*In local currency, NEC's software revenues were up 16.7% to ¥114.1 billion, Fujitsu's were up 16.1% to ¥86.6 billion, Siemens' were up 11.1% to DM1.1billion, Hitachi's were up 18.9% to ¥77.2 billion, Nixdorf's were up 0.8% to DM735 million, Olivetti's were up 19.5% to L539.4 billion

**Restated figures for 1987

†Percentage share of software revenues

☐ VENDORS RIDE THE SYSTEMS INTEGRATION BOOM TO NEW HEIGHTS

BY ROBERT L. GOODWIN

Information services include professional services, systems integration, processing services and network services. Each of these markets exhibited considerably stronger performances than most equipment sectors.

Systems integration has become an important distribution channel for delivery of complex, multivendor systems. The segment is expected to increase at a compound average annual growth rate (CAGR) of 25% over the next five years in the United States, according to the Mountain View, Calif.-based market research firm Input. This market will grow from $5 billion in 1988 to $15 billion in 1993. The commercial sector will grow 31% while federal spending increases at a "mere" 18%.

Users' acceptance of systems integration is fueled by the growing perception that a well-established and reputable prime contractor may often be the best choice to manage the difficult process of creating, installing and sometimes operating very complicated systems.

Systems integration is a market dominated by large firms with deep pockets. Andersen Consulting, Computer Sciences Corp., Electronic Data Systems Corp., IBM and Unisys Corp. have leading market shares; and Digital announced its entry last fall, punctuated by its selection by Boeing Co. to provide a major manufacturing system.

Professional services include consulting, software development, education and training, and systems operations (facilities management) of client-owned systems. These services generated $15 billion in the U.S. during 1988 and will grow at a 16% CAGR, up to $32 billion in 1993. Nearly 60% of these expenditures are for software development.

The leading vendors in this market, not coincidentally, include the more prominent systems integrators, since professional services skills are a vital part of any systems integration activity. Andersen Consulting, Computer Sciences, EDS, IBM, Planning Research Corp., and TRW Inc., are among the largest vendors. This is a fragmented industry, unlike systems integration. The 10 leading vendors have a combined market share of 30%, leaving opportunities for smaller players with specific technical skills.

In both systems integration and professional services markets, project management skills are crucial. Firms with a staff of skilled project managers are leveraging this resource in their sales activities. Similarly, use of development methodologies and computer-assisted software engineering (CASE) tools provide competitive advantage to their suppliers. CASE tools are still used infrequently by information services departments, despite all the publicity surrounding the technology. Professional services firms are being more aggressive in deploying these techniques, and the strategy is working.

Processing services markets are growing more slowly than the other services sectors, but still remain healthy. From a large $19 billion base in 1988, processing services expenditures will grow at a 12% CAGR, reaching $33 billion in 1993.

Major players entered this market years ago, staked out a market niche and have held it against the inroads of mini- and microcomputers, through superior customer service, continuing product improvements and rapid delivery.

Market leaders that have chosen to specialize include Automatic Data Processing Inc. (in payroll), EDS (in medical claims processing) and Shared Medical Systems (in hospitals). By contrast, McDonnell Douglas Information Systems and Control Data Corp. have introduced a wide range of processing services and have also achieved significant revenues. Many professional services vendors have aggressively moved into other delivery modes, such as turnkey systems, software products and professional services, as a hedge against the slower growth rate in processing services.

Network services (on-line data bases, value-added networks, electronic data interchange (EDI), electronic mail) will grow at a strong 23% CAGR, from $6 billion to $17 billion during the next five years. Data base vendors represent nearly 80% of these expenditures, primarily in the credit, stock quotation, financial, news, medical and legal categories. A handful of large firms, including Dow Jones & Co., Equifax Inc., Mead Data Systems, Quotron Systems Inc. (a CitiCorp subsidiary), Reuters Holdings PLC, Telerate Systems Inc. and TRW have captured nearly 50% of the data base market. ☐

Robert L. Goodwin is vice president of Input in Mountain View, Calif.

The Top 15 in Services

EDS passed ADP and TRW to take the top spot in 1988.

	DTM 100 RANK	COMPANY	SERVICES REVENUES 1988 ($MIL.)	1987 ($MIL.)	% CHANGE*	MARKET SHARE†
1	27	Electronic Data Systems	1,907.6	1,440.5	32.43	9.7
2	26	TRW	1,805.0	1,780.0	1.40	9.1
3	33	Automatic Data Processing	1,617.0	1,467.0	10.22	8.2
4	45	Computer Sciences	1,253.4	1,133.8	10.55	6.3
5	39	Arthur Andersen	1,158.5	705.9	64.12	5.9
6	16	Control Data	1,114.2	896.4	24.30	5.6
7	53	Cap Gemini	976.5	682.3	43.12	4.9
8	1	IBM	935.0	850.0	10.00	4.7
9	31	NTT	847.0	565.6	49.75	4.3
10	5	Unisys	825.0	800.0	3.13	4.2
11	43	McDonnell Douglas	791.0	825.4	(4.17)	4.0
12	65	Martin Marietta	743.4	685.7	8.41	3.8
13	80	Emhart	508.9	404.8	25.72	2.6
14	68	General Electric	495.0	450.0	10.00	2.5
15	86	American Express	446.9	383.0	16.68	2.3

*In local currency, Cap Gemini's services revenues were up 41.9% to Fr5.8 billion and NTT's were up 32.7% to ¥108.5 billion.

†Percentage share of DTM 100 services revenues.

☐ STANDARDS EMERGE, VENDORS MERGE AND CUSTOMERS RULE

BY KIM MYHRE

While many things have happened in the data communications business in 1988, very little has actually changed. The industry continued to debate emerging technical standards; there were ongoing joint ventures, mergers and acquisitions among vendors; and customers continued to struggle for control over their present and future technology investments.

These themes reflect the natural maturation of the networking business.

Market maturity is both bad and good for the network business. Bad: many of the smaller technology innovators are devoured as competition intensifies in a natural market selection process where only the strong survive. Good: with market maturity come opportunities to buy standardized, lower priced, tested and proven products from credible vendors who survived the shakeout.

If you are to believe network vendors, customers now call the shots with regard to vendor strategy and product development. These customers are now sitting on massive investments in numerous incompatible and proprietary systems, each of which remains isolated due to proprietary networking approaches. All this, at a time when networking has become critical to every organization's ability to make it in an increasingly competitive global marketplace.

What's a customer to do? Close the cash box, demand standards and watch vendors scramble to provide solutions.

Vendors have gotten the message about standards loud and clear. Never before in the information industry has there been so much discussion and controversy over standards. One IS manager recently said that one of the most frustrating aspects of his job is that most of the products on which his company's networking strategy are based are not yet available. During the past year vendors dangled a number of "emerging" technologies and "developing" standards before IS managers: OSI, SAA, FDDI, ISDN, OS/2 and the like are predicted to be keys to the future of networking.

Networking has become the new frontier of opportunity for a growing and diverse group of vendors. Facing slackening demand in their traditional market, computer manufacturers are counting on networking to help them thrive into the 1990s. When computer vendors weren't announcing networking strategies, proposing new networking standards or establishing joint ventures with networking companies, they were buying networking companies.

During the past year, IBM continued to fill in the missing links in its approach to networking. It introduced a number of OSI-based products; a 16 megabit version of its popular Token Ring LAN; Lan Server—its own slightly modified version of the OS/2 LAN Manager developed by Microsoft Corp. and 3Com Corp.

Digital Equipment Corp. stepped up its already highly regarded efforts in the networking arena with a joint venture with Northern Telecom Ltd. to develop integrated voice/data applications. Digital also announced a network management solution called Enterprise Management Architecture (EMA), which approximates OSI standards, and its own flavor of IBM's Systems Application Architecture (SAA), called Application Integration Architecture (AIA).

Data General Corp. jumped into the networking fray by announcing its own OSI-based networking strategy and joined some 14 other vendors including Unisys Corp., Prime Computer Inc. and NCR Corp. to act as an original equipment manufacturer (OEM) for the Portable Netware LAN operating systems software from Novell Inc. While Novell was picking up Netware supporters and looking to acquire TCP/IP LAN vendor Excelan Inc., other independent LAN suppliers were building their OEM relationships.

3Com and Hewlett-Packard Co. teamed up to support and promote 3+ Open LAN Manager and LAN Manager/UNIX (LM/X), developed by HP and Microsoft. The two companies will support a common set of TCP/IP protocols and jointly offer customer services. To cement the commitment, HP will initially take a 5% equity investment in 3Com.

A number of data com companies have experienced a shift in demand in traditional markets that has forced them to seek partners or revamp product lines. Both Codex Corp. and Racal-Milgo have announced layoffs while maintaining strength in markets for T1 multiplexers and high-speed modems. Paradyne Corp. was acquired by AT&T. Speculation has it that competition from Paradyne interfered with AT&T's plans. ▭

Kim Myhre is with Cahners Business Research Group.

The Top 15 in Data Com

Fax sales boosted the fortunes of Canon, Matsushita and Ricoh.

	DTM 100 RANK	COMPANY	DATA COM REVENUES 1988 ($MIL.)	DATA COM REVENUES 1987 ($MIL.)	% CHANGE*	MARKET SHARE†
1	1	IBM	1,600.0	1,507.0	6.17	10.1
2	8	Siemens	1,338.3	1,402.1	(4.55)	8.4
3	21	AT&T	1,250.0	1,010.0	23.76	7.9
4	15	Canon	1,132.3	742.9	52.42	7.1
5	4	NEC	963.8	842.1	14.45	6.1
6	14	Matsushita	929.1	680.2	36.59	5.9
7	56	Northern Telecom	900.0	865.0	4.05	5.7
8	30	Ricoh	850.3	590.9	43.90	5.4
9	3	Fujitsu	816.7	674.4	21.10	5.2
10	13	Toshiba	762.4	615.4	23.89	4.8
11	31	Alcatel	721.9	1,039.3 **	(30.54)	4.6
12	61	Motorola	565.0	528.0	7.01	3.6
13	77	Racal Electronics	491.8	488.7	0.63	3.1
14	19	NV Philips	460.3	518.3	(11.19)	2.9
15	7	Hewlett-Packard	400.0	330.0	21.21	2.5

*In local currency. Siemens' data com revenues were down 6.8% to DM2.3 billion, Canon's were up 35.1% to ¥145.1 billion, NEC's were up 1.4% to ¥123.5 billion, Matsushita's were up 21% to ¥119.1 billion, Ricoh's were up 27.5% to ¥109 billion, Fujitsu's were up 7.3% to ¥104.7 billion, Toshiba's were up 9.8% to ¥97.7 billion, Alcatel's were up 32.2% to ECU610 million, Racal's were down 7.5% to £276.4 million, Philips' were down 13.3% to G910 million.

**Restated figures for 1987

†Percentage share of DTM 100 data com revenues

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DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

THE SELLING OF I.S.

Users Are Offering Their IS Expertise for Sale.
But at What Price?

MANUFACTURING
GOVERNMENT
$$
$$
BANKS

Also in This Issue:
How To Reap a Harvest With CASE
DEC Goes Back to the OLTP Drawing Board
Data Encryption Is a Secret No More
The Liabilities of Working at Home

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NUMBER 13

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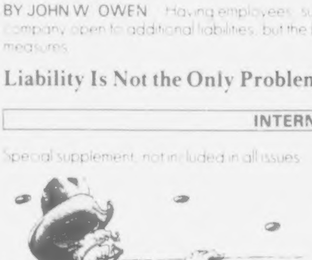

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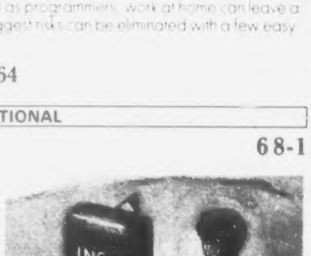

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The Spread of the Entrepreneurial Spirit

There's nothing quite like the power of an idea. An idea can neither be confined nor possessed. It has no sense of loyalty. And it cannot experience pleasure or pain. But when an idea takes hold in the minds of people, it can become more powerful than an atomic bomb, with consequences even more far reaching. Just witness what the idea of freedom has meant, and how as you read this it is changing cultures, political systems, even whole nations. Recent events in the Soviet Union are a case in point.

In our industry, the idea is spreading that the information systems function can do more than it has before. And if what we've seen so far is any indication, that idea is spreading fast. The "more" in this instance is selling the accumulated expertise of a company's internal IS organization on the open market. Whether it is incorporated in software or a service like facilities management, this expertise is being leveraged by IS departments any way they can.

But the reasons that IS executives get into the business of selling IS expertise are certainly not monolithic. As senior writer Ralph Emmett Carlyle writes in this issue's cover story, "The Selling of IS," page 22, "For some, they are just techies: amateurs playing business games. . . . For others, they personify a trend in which centers of innovation have shifted from vendors to customers and are seen as a vital link in the industry's evolution. . ."

For Carlyle, who has been writing about information systems in DATAMATION for 13 years, the trend provides an opportunity to offer insights about the changing nature of the IS function and the role of the people running it. Solving problems may be rewarding, he says, but there are other motivations as well. Using IS to generate revenue and profit for a company, and therefore changing the perception that the IS organization is solely a cost center, is also a powerful idea.

Photograph by Peter Sylwa/Blackstar

SENIOR WRITER CARLYLE: Probing the spirit of entrepreneurial IS managers

Carlyle is quick to point out, however, that sometimes the rush to embrace the entrepreneurial spirit can be a reaction to reversals in a company's core business or a result of the industry's downsizing trend. Moreover, such a new role may not be easy to manage, particularly if a company runs the risk of selling expertise that has served to differentiate it from its competition.

CASE and Spreadsheets

Much has been written about the need for and benefits of computer-aided software engineering (CASE), but a recent University of Houston survey homes in on the actual effect CASE has on programmer productivity. Based on a survey of actual usage at 12 companies, our article, "Reaping CASE Harvests," page 31, tells where CASE has been effective and what the training and implementation challenges are for this important technology.

David R. Brousell, Executive Editor

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Reaping CASE Harvests

A University of Houston survey finds small software projects to be a fertile field for CASE tools. However, the adequacy of current tools for complex software development is by no means widely accepted.

BY MARCUS LOH and R. RYAN NELSON

Obtaining satisfactory results from computer-aided software engineering (CASE) can be a lot like gardening. The size of the harvest is determined to a large extent by when and where the seeds are sown.

Productivity gains from the use of software engineering tools vary depending on the suitability of a software project and programmers' acceptance of CASE, a survey recently conducted by the University of Houston of some 40 programmers, analysts and systems designers at 12 companies reveals. Among the survey's other findings:

- Using CASE typically changes existing development methodologies.
- Training programmers and designers in the use of CASE tools is no simple task. The variety of tools and a reluctance to change development habits are major hurdles to the successful use of CASE.
- Using CASE tends to result in a shift in programming time to front-end development, such as planning and design. Moreover, its use significantly lowers the time spent on writing code and maintaining software.

Overall, survey findings illustrate the selective impact that CASE has on programmer productivity. While companies generally agreed that using CASE tools increased productivity in all phases of the systems development cycle, proficiency in a particular tool, the size of the development project and the degree of tool integration all affect the results that can be obtained.

Beyond productivity, however, improved quality of software products, standardized development techniques and better project management were cited as CASE-related benefits by most respondent companies. But the study also identifies common problems in implementing CASE and shortcomings in the current generation of tools.

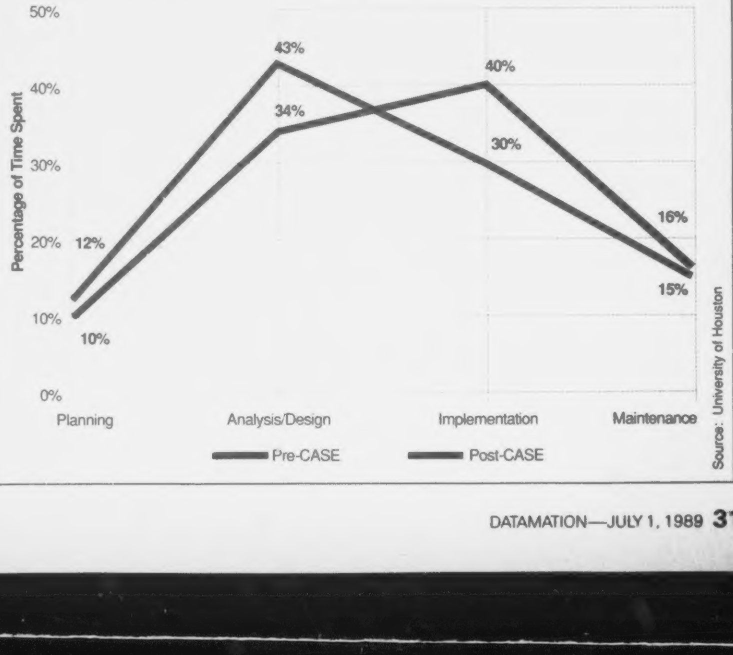
CASE tools automate tasks associated with the software development life cycle. Depending on their degree of tool integration and scope, these tools are either referred to as "toolkits" or "workbenches." For the purposes of the survey, a toolkit is defined to be a set of integrated CASE tools designed to work together to automate, or partially automate, a particular development job or a single phase of the systems development cycle. Workbenches are integrated CASE tools that assist across all phases of the systems development cycle—planning, analysis and design, implementation and maintenance.

Training Is Not Trivial

A significant finding concerned the amount of time most developers require to become adept in the use of CASE. Programmers, analysts and designers report they spend an average of 69 hours learning to use CASE tools on their own. Company-operated group-training sessions and private instruction account, on average, for another 86 hours of training. Such lengthy training requirements can impede CASE use.

Front End Tasks Consume More Staff Time

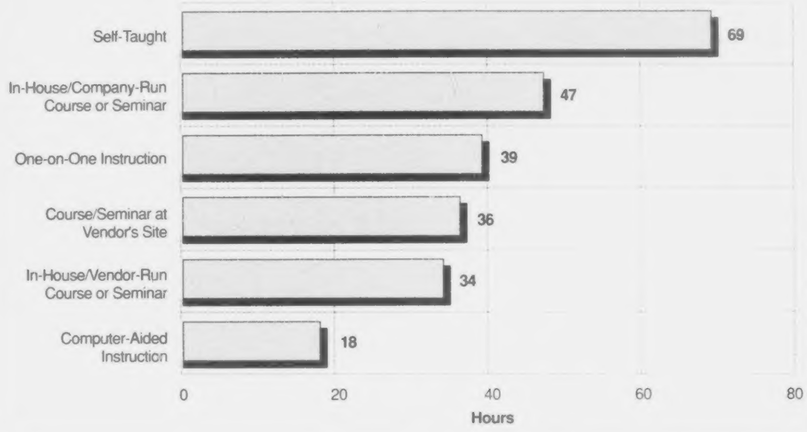
When CASE tools are employed, software development activity shifts from back-end coding and maintenance to front-end planning, design and analysis as a percentage of total time spent.



Source: University of Houston

Training Needs Consume Significant Time

Hours spent individually learning CASE tools far exceeds time in structured courses or seminars.



Source: University of Houston

For instance, hefty training needs prompted Service Corp. International (SCI) to replace a CASE tool from Atlanta-based KnowledgeWare Inc. in favor of data-modeling tools from Kimberly-Clark Computer Services Inc. in Dallas. The latter tools are tailored to a fourth-generation language and data base that are familiar to SCI's programming staff.

"The learning curve was much more difficult than we thought it would be," says George Shackelford, director of management information systems for SCI, a Houston-based operator of funeral homes. "Training was expensive, the package was expensive and then we found we had to spend several months to become proficient in it."

Training needs may reflect the users' tendency to implement two or more different CASE tools. In our sample, 25 different CASE tools were used among the surveyed companies. These firms showed a more than two-to-one preference for toolkits over workbenches. All but three of the 12 companies surveyed acknowledged using two or more vendors' tools.

Reasons for CASE Failures

A lack of involvement in selecting the CASE tools by those who use them may affect training needs. Most of the programmers and analysts we surveyed did not participate in their company's tool selection. In addition, poor training is high on the list of reasons for CASE failures, says Neil Tramel, an Electronic Data Systems Corp. development manager in Houston. But, according to Tramel, the three most common reasons for failure are a staff that doesn't understand methodologies, inadequate staff training and operating without management support.

Among the reasons for tool selection, survey respondents mentioned text and graphics integration, flexibility for stand-alone or LAN-based use and suitability for particular applications.

☐ POOR DATA SHARING BY EXISTING CASE TOOLS CONFINES USE TO SMALL PROJECTS.

CASE tools primarily are applied to the front end of the systems development cycle among the companies we surveyed. Every company acknowledged using at least one tool for the analysis and design phase and 75% used planning tools. Only 50% use tools for back-end coding and maintenance phases. One-quarter of the respondents reported using CASE tools throughout the systems development cycle.

On a scale of 1 to 5 (ranging from poor to exceptional), survey respondents rated their CASE tools a favorable 3.69. For individual phases of the software development cycle, CASE tools rated weakest in implementation (3.38) and maintenance (3.40) and strongest in analysis and design (3.85). Planning tools received moderate approval, with a rating of 3.50.

The higher rankings for front-end tasks support one respondent's conclusion that CASE tools provide "significant productivity gains on simple tasks, but there are no savings for complex tasks." The greatest savings in development come from automating merely clerical functions, such as diagraming. For instance, one company reports that, using CASE, a data flow diagram that ordinarily took two to three weeks to develop manually was constructed in one to two days.

Such benefits disappear for development projects ordinarily taking more than two years to complete. On projects of up to two years, CASE appears to have been able to reduce the average number of hours spent per project by 20%. For projects over two years, however, there was no significant reduction in time.

We believe the root of this productivity decline is the difficulty current tools have in sharing data. Given the greater data-sharing requirements of complex systems, this drawback places a restriction on the use of CASE tools in larger development projects.

The companies that we interviewed indicated that this lack of, or awkward nature of, interfaces to other tools, combined with poor compatibility, was a serious shortcoming of CASE tools. Furthermore, the typically long learning curve and the lack of a facility to forecast performance of the target system were mentioned as weaknesses by most companies surveyed.

Another sign of the immature state of existing tools was reflected in the time spent in the various phases of development. Prior to the implementation of CASE tools, companies reported that 44% of development time was devoted to planning, analysis and design. After using these tools, this percentage increased to 55%.

Our conclusion is that CASE tools effectively shift manpower expenditures to the front end of the development life cycle. However, this should be viewed as a benefit. Many experts claim a higher percentage of time should be spent in front-end activities.

More than 80% of the companies interviewed reported altering their chosen methodology as a result of using CASE tools. For example, four companies acknowledged adopting Gane and Sarson standard methodologies for data analysis and design. In fact, only two companies were able to use CASE tools with their existing methodology.

User Involvement Helps

Virtually all companies cited productivity increases in the analysis and design phase. For example, they found that information was captured quickly in joint application design sessions. Similarly, quality improvements were attributed to the enhanced user participation in analysis and design.

Respondent companies also averaged a 35% increase in productivity in the maintenance phase because applications required less rework. Having a common structure across programs made the maintenance effort much easier, they felt. Only two companies reported a reduction in productivity in the implementation and maintenance phases. Those who experienced a productivity decrease felt that less time was allocated to the latter phases and too much time to analysis and design.

Users generally indicated that CASE tools not only promoted gains in productivity but also provided consistency, facilitated communication and achieved significant savings in development time. CASE tools allowed designers to produce and maintain standardized design formats and similar screens and menus. This consistency permitted easier movement of people from one job to another. Better communication resulted from the joint analysis and design workshops at one company, allowing for better understanding by users, designers and managers. Moreover, the tools' graphic depiction of complex systems forged a common language for designers and users to discuss projects.

Better quality projects are produced more quickly after using CASE tools. This improvement is attributable to the use of diagraming and the resulting more precise data model.

Virtually all respondents asked for better interfaces and integration, reflecting a belief that there is no comprehensive tool that can handle all phases of the systems development life cycle. Even if such a product were available, respondents said, they would still be concerned about its ease of use.

Based on the findings in this survey, CASE tools have had a significant impact on the systems development process. Not only do programmers and analysts seem to become more productive they also seem to spend more of their time in the early phases of the development life cycle rather than on implementation and maintenance.

However, the unevenness of productivity gains across the development life cycle suggests that improvements are needed in tool integration and/or interproduct compatibility. The long learning curve that current products require also suggests companies must continue to devote a high level of organizational resources to CASE training. ▭

Marcus Loh is a graduate student in business administration, and R. Ryan Nelson an assistant professor of management information systems, at the University of Houston.

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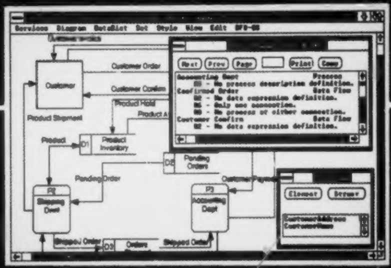

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The Battle For Europe

The world's vendors are jockeying for position as the battle heats up for IS rule in the single European market.

BY PAUL TATE

THE
EUROPEAN
25

It was a year of furious preparation for the IS industry in Europe. Throughout 1988, companies across the globe gathered their European forces, forged strategic alliances across the region, reorganized their internal lines of command and prepared for a competitive onslaught the likes of which neither Europe—nor any other continent—has ever seen.

The increasingly realistic prospect of a single market emerging sometime after 1992 has turned Europe into a global battlefield once again. Europe's IS markets have always been noted for their fierce combination of pan-European U.S. giants, patriotic national champions and major Japanese distributors. But, in the past, the majority of clashes among them were local incidents. In 1988 all three groups took the fighting onto a European plane. It was the year that the battle for the single European market really began.

The 25 companies most likely to succeed in the new Europe make up the 1988 DATAMATION Top 25. Together, their combined IS revenues rose 16.8% in U.S. dollars to $66 billion. Because the dollar fell slightly against most European currencies—about 2 to 3%—the increase in revenues in European currencies was less than what it was when calculated in dollars. And with European merger activity high, real growth is closer to 13%.

The threshold of entry to the DATAMATION's European elite soared in 1988, however—up from $493 million in 1987 to $723 million in 1988, a massive increase of 47%. The big in Europe are getting bigger. With a total European IS market of over $90 billion in 1988, the Top 25 companies represent over two-thirds of 1988 European IS sales.

IBM Grows But Loses Share

IBM still rules the European market, with revenues almost four times larger than its nearest rival, West Germany's Siemens AG. IBM Europe's IS revenues were up 10.3% in 1988 at $20.5 billion—the first time the company has burst through the $20 billion barrier in Europe.

Last year Big Blue's European revenues accounted for 34% of IBM's corporate sales and 43% of its profits. While the company watched profits tumble by 27% and revenues dip by $184 million in its U.S. operations, IBM Europe pushed income up 6% to $2.3 billion. The importance of the European operations to IBM's global health is increasing—but it hasn't been easy.

IBM managed to claw back some growth during 1988 in most of its major markets after a dreadful 1987. The revenue improvement was due in part to widespread interest in its AS/400 systems and an increasing number of lucrative systems integration and networking deals. Even so, its share of the European Top 25 revenues is down again to 31% from 33% in 1987 and 42% only four years ago in 1984.

Big Blue's biggest sigh of relief came in West Germany, where its oldest and largest foreign subsidiary managed to improve sales 5.5% after dropping 3.5% of revenues in 1987. Last year, it brought in $4.2 billion worth of business—accounting for 20.4% of IBM's European sales.

In France, the second largest market for IBM, revenues were up 8.0% after a flat 1987. The United Kingdom's position as IBM's European number three market with $3 billion in revenues is now in jeopardy, however. The Italian market is booming, and after a 13.5% rise in 1987 and another 14% in 1988, IBM Italy is now only a hairbreadth away from toppling the U.K. subsidiary, with Italian sales reaching $2.99 billion last year.

INTERNATIONAL

EUROPE: The world's vendors are jockeying to be in position for the single European market. 68-3

ITALY: Benetton's visionary senior management has used IS to sharpen the company's competitive edge. 68-15

EUROPE: Managers are beginning to come to grips with executive information systems 68-17

INNOVATIONS: NEC's new supercomputers; ozone-friendly printers from Memorex Telex. 68-20

Europe's other booming market—Spain—provided IBM with 16% more sales than in 1987, and in the Netherlands, where revenues plummeted by 18% in 1987, the Dutch subsidiary regained some momentum and reported a 10% increase for 1988 to $940 million (see chart, "IBM Europe's Major Markets").

Japanese Firms Enter the Top 25

IBM is one of 10 U.S. companies on this year's European ranking, with 13 Europeans and for the first time two Japanese firms—printer specialist Canon Inc. at $1.05 billion and plug-compatible mainframe supplier Hitachi Ltd. with $824.8 million. The combined European revenues of the 13 European firms amounted to over $28 billion, accounting for 43% of the total revenues of the Top 25 companies. That's down a little from the 46% share enjoyed in 1987, but more than the 41% garnered in 1986.

The Japanese are a new factor. Selling its plug-compatible manufacturers machines through National Advanced Systems Corp., Comparex Informationssysteme GmbH and Ing. C. Olivetti & Co. SpA, Japan's Hitachi has become a powerful force in European mainframe sales. This may increase further when Comparex completes its acquisition of the European operations of NAS later this year. The coordinated sales operations should clear the way for further market growth before IBM muddies the waters once again with its new Summit mainframe line.

While both the Japanese companies in the ranking have shown strong progress in Europe over the last year, inadequate geographical breakdowns from the Japanese companies have precluded their inclusion in previous rankings.

Hitachi and Canon are two of the six new names on the 1988 Top 25. Also featured this year is Finland's aggressive IS group Nokia Data Systems, which acquired the Information Systems Division of Sweden's LM Ericsson in early 1988. In the first year, the consolidated revenues of the new Nokia Corp. reached $1.2 billion, putting it in 14th position.

Prime Computer Inc. enters the table at number 18 with revenues of $909 million, up substantially over 1987 due to its acquisition of Computervision Corp. Control Data Corp. has jumped back onto the ranking in 1988 after an absence of one year, this time at number 23, with revenues of $781 million, and the current darling of Wall Street, U.S. PC supplier COMPAQ Computer Corp., has burst in at number 25 after raging growth in Europe as well as the United States.

Barriers to Entry

The rising entry threshold took its toll on companies that were nevertheless performing well. Altogether, six firms are no longer on the ranking this year. Apart

The Top 25 Suppliers in Europe

Ten U.S. companies rank among the biggest vendors.

1988 RANK	1987 RANK	COMPANY	COUNTRY	1988 EUR. IS REV.	% CHG. FROM 1987 $/AAC*	TOTAL IS REV.	% CHG. FROM 1987 $/AAC*	EUR. % OF TOTAL IS/ % CHG.
1	1	IBM	U.S.	$20,520.0	10.3/—	$55,002.8	8.7/—	37/0
2	2	Siemens	W. Germany	5,296.4	6.7/4.3	5,951.0	4.4/2.0	89/2
3	4	Digital Equipment	U.S.	4,422.5	29.0/—	12,284.7	18.2/—	36/3
4	3	Olivetti	Italy	4,396.6	15.6/16.0	5,427.9	17.0/17.5	81/(1)
5	6	Groupe Bull	France	4,025.5	11.1/10.1	5,296.7	6.7/5.7	76/3
6	5	Nixdorf	W. Germany	2,831.8	6.8/4.3	3,044.9	7.9/5.4	93/(1)
7	7	Unisys	U.S.	2,639.0	14.0/—	9,100.0	2.2/—	29/3
8	9	Hewlett-Packard	U.S.	2,331.0	29.5/—	6,300.0	26.0/—	37/1
9	8	NV Philips	Netherlands	2,207.7	7.4/4.8	2,794.6	7.4/4.8	79/0
10	10	STC	U.K.	2,061.3	19.3/10.1	2,425.1	14.2/4.9	85/4
11	11	NCR	U.S.	1,756.9	7.9/—	5,324.0	4.7/—	33/1
12	13	Alcatel	France	1,647.4	29.5/26.1	1,716.0	(16.5)/(18.5)	96/34
13	15	Société Générale	France	1,173.7	21.0/19.9	1,222.6	26.0/24.9	96/(4)
14	—	Nokia	Finland	1,165.1	179.1/165.8	1,165.1	179.1/165.8	100/0
15	16	Atlantic Computers	U.K.	1,113.5	16.4/6.9	1,341.6	30.5/19.9	83/(10)
16	—	Canon	Japan	1,051.4	47.8/31.0	3,391.6	43.0/26.8	31/1
17	21	Apple	U.S.	931.2	70.1/—	4,434.1	45.8/—	21/3
18	—	Prime	U.S.	908.6	186.5/—	1,594.0	65.9/—	57/24
19	19	Wang	U.S.	891.6	8.4/—	3,074.4	0.9/—	29/2
20	—	Hitachi	Japan	824.8	19.5/5.9	8,247.6	31.5/16.5	10/(1)
21	22	Cap Gemini Sogeti	France	800.7	46.7/45.4	976.5	43.1/41.9	82/2
22	24	Amstrad	U.K.	782.9	14.1/4.8	841.8	15.3/5.9	93/(1)
23	—	Control Data	U.S.	781.0	(6.2)/—	3,524.3	9.4/—	22/(4)
24	14	Inspectorate Int'l	Switzerland	725.9	0.4/(1.9)	1,230.3	0.4/(1.9)	59/0
25	—	Compaq	U.S.	723.0	146.1/—	2,065.6	68.7	35/11

Source: DATAMATION.
All currency figures are in millions.

from Ericsson, the other company that has merged is Honeywell Bull Inc., now controlled worldwide by France's Groupe Bull, which ranks at number five on the list.

The only company that dropped in ranking due to reduced sales was Netherlands-based Memorex Telex NV, which reported European revenues down 18% at $685.9 million. By contrast, West Germany's Mannesmann Kienzle AG had a booming year with IS sales up 16%. But its $717 million sales figure was too low to place the company on the table and Mannesmann slipped from 20 in 1987 to number 26. Leasing company Econocom International BV slipped from number 23 also off the table to number 29 despite revenues being up 26% to $664 million, while Amdahl Corp. reported revenues up 13% to $559 million but dropped from last year's number 25 slot down to number 32 in 1988.

Reporting solid growth and booming revenues last year and approaching the new threshold were Xerox Corp.'s European joint venture, Rank Xerox, which is doing well with revenues up to $677 million, and Commodore International Ltd., which pushed its European sales up to $621 million in 1988.

Nine companies ascended in rank on the table last year, four slipped down and six remained in the same position. The biggest jump was Apple Computer Inc.'s surge from number 21 in 1987 to number 17 in 1988. This reflects the burgeoning PC market in Europe, which also pushed U.K.-based PC maker Amstrad PLC up two places from number 24 to number 22, and also accounts for Compaq's sudden arrival at number 25. Also heading upward by two places was French bank Société Générale, reaching number 13. Société Générale has two main interests in the IS sector—its Europe Computer Systems leasing operation and the SG2 software and services company. ECS performed particularly well, and between the companies they pushed the bank's IS revenues up 21% to $1.2 billion.

Surge Continues

Moving up by one point was Digital Equipment, which has pushed Olivetti out of the number three position. This is the second year that Digital has proved how much life there is in the European market. In 1987 it reported an increase of 27% in sales and in 1988 it added a 29% surge to its European business. Two of Europe's mini makers—Norsk Data AS in Norway and Nixdorf Computer AG in West Germany — suffered, however, with losses of $42 million at Norsk and profits below expectations at Nixdorf.

Also up one position each were Alcatel NV (now at number 12), U.K. leasing company Atlantic Computers PLC (at number 15), France's Cap Gemini Sogeti (at number 21), France's Groupe Bull (which replaced Nixdorf at number 5) and Hewlett-Packard Co. (at number 8).

Sliding down the list were Nixdorf, Olivetti and NV Philips' GL each by one place, and Swiss-based leasing group Inspectorate International Ltd. fell by 10 places to its rightful position at number 24 (1987 figures have been restated).

Widespread Restructuring

Corporate reorganization characterized many of the European companies during 1988. In Scandinavia, Nokia Data spent the year merging its activities with the data systems division of Ericsson Information Systems. In the Netherlands, Philips began to build a new corporate organization around four core businesses—one of them information technology—and trying to coordinate its worldwide marketing and manufacturing activities. In addition, Alcatel, registered in Amsterdam but headquartered in Paris, is still interweaving Compagnie Générale Électricité's IS operations and ITT's European network of offices.

Both Olivetti and Siemens announced massive restructuring programs toward the end of the year. Olivetti is being divided into three main subsidiaries: Systems and Networks, Office, and Information Services. By 1994, Olivetti's new joint managing director Vittorio Cassoni expects them to be eligible for listings on the Italian stock exchange.

West Germany's Siemens, meanwhile, plans to divide up its massive product groups into between 15 to 20 independent business units by the end of September. The process will involve shuffling 9,000 staff members around the organization.

This year also featured a significant number of mergers and acquisitions, especially in the software and services sector.

A Shift in Spending

The biggest problems the European contenders are going to have to face over the next year or two may not be in Brussels, where the European Commission is thrashing out the details of the new market structure. The problems may well be in the thousands of IS divisions, user departments and retail outlets found in 17 countries. European market growth is beginning to show signs of slowing down. Not because European companies are not buying as many products, but because they are looking for more value for every

U.S. % OF TOTAL IS/ % CHG.	NET INCOME	1988 EMPLOYEES	FISCAL YEAR END
42/(4)	5,806.0	387,112	Dec.
10/(2)	792.1	353,000	Sept.
48/(3)	1,209.1	124,400	July
10/1	273.5	57,560	Dec.
[illegible](3)	50.9	45,557	Dec.
5/1	14.8	31,037	Dec.
54/(2)	680.6	93,000	Dec.
48/(3)	816.0	87,000	Oct.
14/0	534.1	310,300	Dec.
7/(2)	264.9	33,848	Dec.
42/(3)	439.3	60,000	Dec.
0/(31)	497.9	127,000	Dec.
0/0	6.9	1,137	Dec.
0/0	259.7	44,600	Dec.
15/10	65.8	1,431	Dec.
30/(2)	229.5	40,740	Mar.
66/(6)	419.3	10,836	Sept.
43/(14)	19.0	12,500	Dec.
57/(3)	50.1	31,255	June
11/1	1,060.3	161,000	Mar.
18/(2)	67.5	12,000	Dec.
5/2	165.1	1,644	June
71/(4)	1.7	33,657	Dec.
40/—	90.2	7,698	Dec.
61/(13)	255.2	6,000	Dec.

* Actual accounting currency

The Top 25 European Companies

Siemens and Olivetti lead the pack this year.

1988 RANK	COMPANY	COUNTRY	1988 IS REVENUE	% CHG. FROM 1987	% CHG. FROM 1987 IN AAC*
1	Siemens	W. Germany	$5,951.0	4.35	2.0
2	Olivetti	Italy	5,427.9	17.05	17.5
3	Groupe Bull	France	5,296.7	6.69	5.7
4	Nixdorf	W. Germany	3,044.9	7.92	5.4
5	NV Philips	Netherlands	2,794.6	7.42	4.8
6	STC	U.K.	2,425.1	14.18	4.9
7	Memorex Telex	Netherlands	2,078.5	99.64	94.9
8	Alcatel	France	1,716.0	(16.51)	(18.5)
9	Atlantic Computers	U.K.	1,341.6	30.46	19.9
10	Inspectorate Int'l	Switzerland	1,230.3	0.43	(1.9)
11	Societe Generale	France	1,222.6	26.03	24.9
12	Nokia	Finland	1,165.1	179.13	165.8
13	Cap Gemini Sogeti	France	976.5	43.12	41.9
14	Econocom	Netherlands	897.0	33.03	29.8
15	Amstrad	U.K.	841.8	15.28	5.9
16	Mannesmann	W. Germany	779.0	13.56	10.9
17	Comparex	W. Germany	614.5	15.77	13.1
18	Racal Electronics	U.K.	554.1	0.91	(7.3)
19	Finsiel	Italy	545.4	28.60	29.1
20	Norsk Data	Norway	450.2	6.53	3.1
21	Sema Group	U.K.	375.1	90.21	74.6
22	SD-Scicon	U.K.	366.4	27.67	17.3
23	Sligos	France	343.1	47.51	46.2
24	Logica	U.K.	269.9	38.69	27.5
25	GSI	France	262.8	14.01	13.0

Source: DATAMATION, company reports. *Actual accounting currency.
All currency figures are in millions.

mark, franc and pound they spend.

And the balance of spending has shifted markedly over 1988. A DATAMATION Price Waterhouse International user survey shows 19% fewer French and 6% fewer U.K. companies planning to up their hardware budget for 1989, compared with the first quarter of 1988. Most of the money is going into software—developed both in and out of house—and on networks.

As hardware increasingly becomes a commodity product, and the open systems standards movement that began in Europe in the late 1970s and early 1980s creates new dynamics in the European hardware industry market, the competitive focus is on electronic trading links, network services and mission critical systems as the factors for success in a single market.

But both international hardware and software companies alike may have to face a much more difficult problem in Europe over the next few years—the possible emergence of a European trading bloc and all of its incumbent trade barriers. The threat of a "Fortress Europe" developing to protect European companies in the transition to a single market became a potent issue in 1988. It's an issue that many U.S. observers treat seriously and some feel has major global ramifications.

"It seems to me that a common market is inherently discriminatory," said onetime U.S. Secretary of State Henry Kissinger at a recent European conference held by International Data Corp. of Framingham, Mass. "Its external barriers are higher than its internal barriers. That's what makes it a common market. You can negotiate them down, but you must do so from a similar position. I don't think the world of the future will be a matter of GATT [General Agreement on Tariffs and Trade] negotiations between countries, but between trading blocs."

The world's major IS companies are consolidating their positions in Europe before that happens. This year will reveal who wins the first few skirmishes in the battle for Europe.

Results for non-U.S. companies are converted into dollars using Organization for Economic Cooperation and Development (OECD) average exchange rates. For those currencies not part of the OECD, exchange rate information was provided by the International Monetary Fund. For 1988, equivalents to $1 in these currencies were as follows: European Currency Unit, ECU1.15; Finland, Fmk4.18; France, FR5.95; Italy, L1,301.68; the Netherlands, G1.98; Norway, Nkr6.52; Sweden, Skr6.13; Switzerland SFR1.46; the United Kingdom £0.56; West Germany, DM1.76. ▭

IBM's Seven Major Sources of Revenue in Europe

West Germany is IBM's biggest market in Europe.

IBM SUBSIDIARY	1988 LOCAL REV.	1988 LOCAL REV. AAC*	% CHG. FROM 1987	1988 TOTAL REV. AAC*	% CHG. FROM 1987 AAC*	NET INCOME	NET INCOME AAC*	% CHG. FROM 1987 AAC*
West Germany	$4,181.0	DM7,342	5.5	DM11,372	(1.5)	$367.3	DM645	18.3
France	3,379.6	Fr20,129	8.0	Fr38,169	1.2	388.2	Fr2,312	3.1
United Kingdom	3,078.3	£1,730	5.1	£3,874	11.2	581.9	£327	3.8
Italy	2,994.6	L3,898,000	14.0	L6,570,000	21.9	442.5	L576,000	26.0
Spain	1,133.7	Pta132,071	16.0	Pta187,090	5.4	183.7	Pta21,396	(3.6)
Netherlands	940.8	G1,860	10.1	G3,243	0.8	68.3	G135	(35.4)
Sweden	798.7	Skr4,895	12.2	Skr9,024	18.1	64.8	Skr397	5.6

Source: IBM Europe, Paris.
All currency figures are in millions; all exchange rates are OECD average rates for 1988. *Actual accounting currency.

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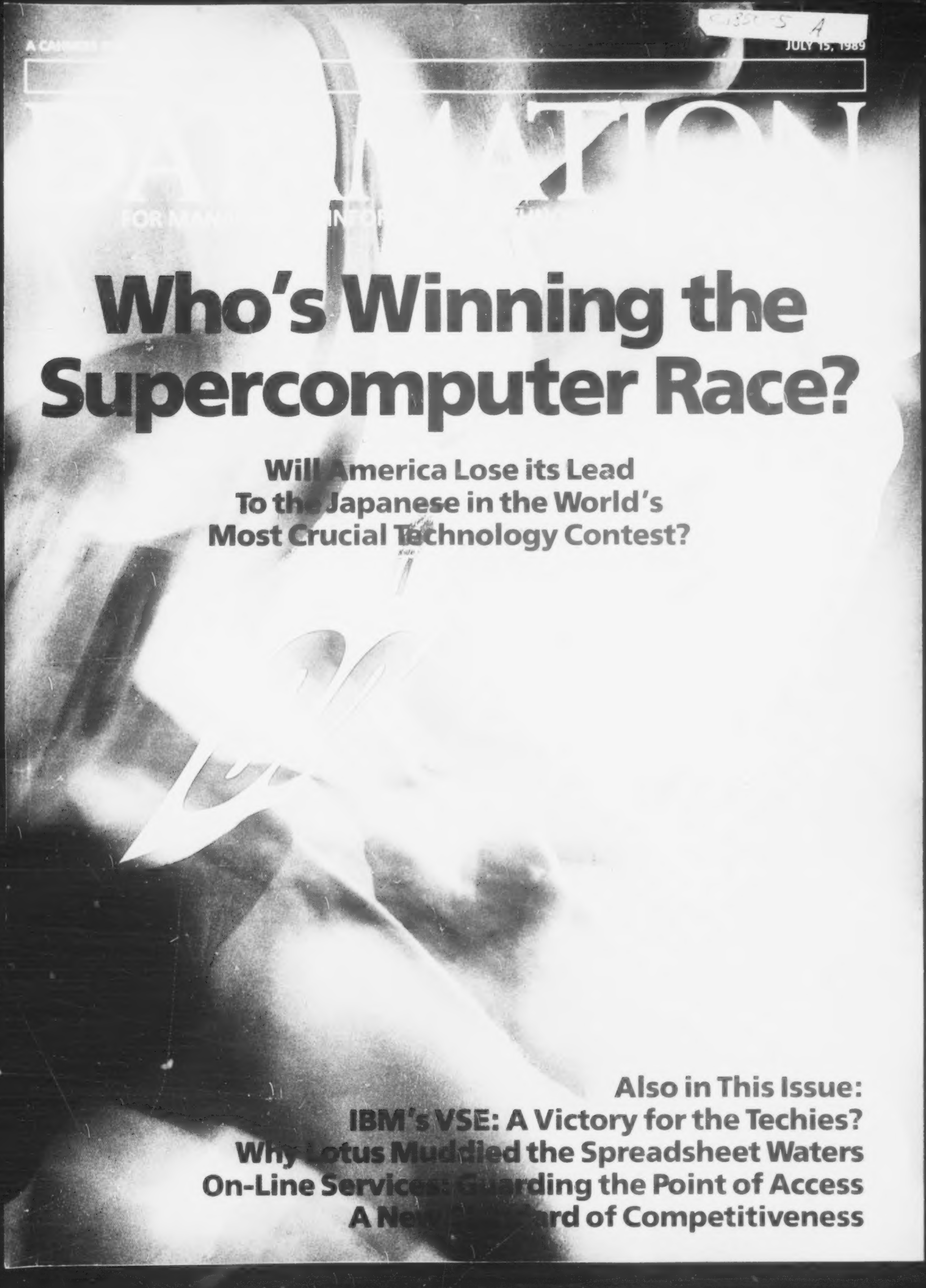

Who's Winning the Supercomputer Race?

Will America Lose its Lead
To the Japanese in the World's
Most Crucial Technology Contest?

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IBM's VSE: A Victory for the Techies?
Why Lotus Muddled the Spreadsheet Waters
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A New Standard of Competitiveness

JULY 15, 1989

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DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

Who's Winning the Supercomputer Race? 18

BY WILLIE SCHATZ Cray Research's current problems, the demise of ETA Systems and advancements in Japanese technology seem to spell doom and gloom for the U.S. supercomputer industry. The Japanese may be ahead in base technology and raw computing power, but the United States still seems to have an edge in systems and applications software.

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Cover Photography by Curt Berner

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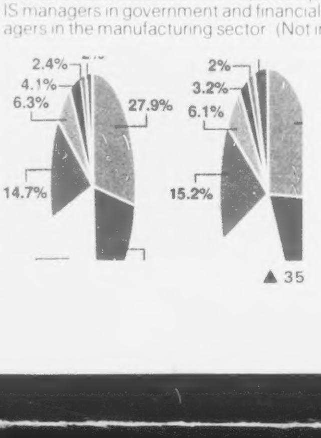
EDITED BY LINDA RUNYAN A report on products, services and methodologies for IS managers in government and financial services. Future editions will serve managers in the manufacturing sector. (Not included in all issues.)



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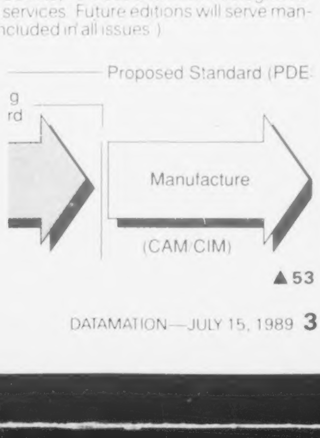

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What's the Supercomputer Race About?

From all the talk and press coverage, one might surmise that the U.S. supercomputer industry is on the endangered species list. After all, the acknowledged industry leader, Cray Research Inc., is undergoing significant change. The company has transferred founder Seymour Cray to a new spinoff, Cray Computer Corp., to continue the expensive development of a supercomputer based on risky gallium arsenide technology. Meanwhile, Control Data Corp. terminated its ETA Systems supercomputer subsidiary altogether. And it seems that Tokyo-based NEC Corp.'s machines may have surpassed Cray's in computing speeds. All of these events could be construed as a rather dark picture of a leading American industry.

The predator in this case is, of course, the fearsome Japanese computer industry—in particular NEC, Fujitsu Ltd. and Hitachi Ltd. Mindful of the fact that the Japanese have dealt a deadly blow to the U.S. semiconductor industry in the area of memory chips, observers of recent events in the U.S. supercomputer industry have been given to much handwringing. Will the Japanese companies, with their longer term view and government support, be able to surpass the U.S. supercomputer industry technologically, thereby placing the U.S. military establishment and the IS industry in position of dependency on a foreign supplier? With Seymour Cray's new company not yet off the ground, and an IBM-backed start-up, Supercomputer Systems Inc., yet to produce its first product, the U.S. supercomputer industry is effectively down to one company. What will happen to the U.S. position in supercomputers now?

Photograph by M.C. Valada

POUNDING THE HIGH-PERFORMANCE computing beat is one of Schatz's chief pursuits.

There is little question about the formidable nature of the Japanese computer companies. They are large, well financed and motivated to succeed in all levels of the computer and electronics industries. But as our cover story, "Who's Winning the Supercomputer Race?" page 18, reveals, the technological facts may tell something of a different story when it comes to supercomputers. "A hard look at a technological scorecard shows that handwringing is probably justified in the areas of base technology and raw computing power," writes Washington bureau manager Willie Schatz. ". . . But in the critical areas of systems and applications software, sighs of woe may be a bit premature."

The Other End of the Spectrum

The role that Lotus Development Corp.'s 1-2-3 spreadsheet played in rocketing the personal computer to fame and fortune has become almost the stuff of legend. But now users are facing a difficult choice, says Dallas bureau manager Bob Francis. Should they migrate to the thrice-delayed release 3.0 or go to the less expensive, but only recently disclosed, release 2.2? Boot up "Muddy Waters," page 31, to help clarify your thinking.

Francis also zeros in on a new challenge facing IS managers. That challenge is the Product Data Exchange Specification, a method of digital product definition that is being touted as a replacement for the Initial Graphics Exchange Specification used in engineering and manufacturing. Changes in the way design, engineering and manufacturing information will be handled could be coming. Access "Competitiveness: A New Standard," page 53, to find out how you should handle those changes.

David R. Brousell, Executive Editor

DATAMATION

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Who's Winning the Supercomputer Race?

Cray Research's current problems, the demise of ETA Systems and the advancements in Japanese technology seem to spell doom and gloom for the U.S. supercomputer industry. But technologically, the race may not be over yet.

BY WILLIE SCHATZ

In some quarters, the handwringing has begun. Cray Research Inc., the world's foremost supercomputer maker, faltered, then split in two. Control Data Corp.'s anemic ETA Systems subsidiary expired, leaving the industry and the United States at large with only the divided Cray and an IBM-backed start-up, Supercomputer Systems Inc., that is still several years away from producing its first machine. The Japanese, meanwhile, forge ahead with ever faster supercomputers.

Could it be that the United States, the world's leader in computer technology, is losing its edge in supercomputers, perhaps strategically the most important class of computers? Could U.S. industry, particularly in its research and development efforts, be hurt as a result?

A hard look at a technological scorecard shows that handwringing is probably justified in the areas of base technology and raw computing power, if the Japanese are able to deliver the performance in their next generation of systems. But in the critical areas of systems and applications software, sighs of woe may be a bit premature.

Furthermore, installation figures show considerable strength for Cray. Cray has sold 16 supercomputers in Japan, 13 of which have been installed. To date, only three Japanese supercomputers have made it into the United States—an NEC Corp. SX-2, installed at the Houston Area Research Center, and two Fujitsu Ltd. VP-100s installed at the U.S. headquarters of the Norwegian oil company, Geophysical Co.

The Japanese Edge

In terms of base technology, the Japanese seem to be in the lead. First, U.S. companies have become

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dependent on Japanese component suppliers. For example, Cray employs Fujitsu memory chips in its current generation X-MP and Y-MP supercomputers. Second, in terms of architecture, NEC's SX-X's silicon pipeline construction, which enables the machine to operate in parallel, beats the Y-MP's silicon vector arrangement, which does not allow for parallel processing.

In the important category of speed, the Japanese also seem to be in the lead, especially when the specifications for the coming generation of products are examined. NEC's eight-model SX-X family will first be available in the third quarter of 1990. The highest end SX-X44 supercomputer is expected to perform, theoretically at least, at 22 billion floating point operations per second. This compares with only 2.8GFLOPS for Cray's current top-of-the-line Y-MP and an expected 16GFLOPS for both the C-90 and Cray-3, due out next year.

"If performance is all that matters, I'd choose the SX-X over the Y-MP," concludes Peter Patton, director of technology assessment for the Superperformance Computing Service of the San Jose-based market research company Dataquest Inc. "For starters, it's got a clock speed more than twice as fast [as Cray's machine]. . . . Taking what's out there now, the SX-X is the most powerful machine that is deliverable the soonest." The SX-X will be marketed in the United States by the Honeywell-NEC joint venture HNSX Supercomputers Inc. of Burlington, Mass.

Cray probably wins in the software arena, but, in terms of operating systems, the lead may not last for long. Cray first came to market with a version of the UNIX operating system, UNICOS, in 1985, but NEC's HNSX may not be far behind. HNSX will make UNIX version 5.3 with 4.3 Berkeley extensions available on its first U.S. machine.

UNIX Is Key

Still, at present Cray has a head start in the form of its installed user base. Of the 220 Cray supercomputers installed in the world, 70 run UNICOS—but 120 run the proprietary Cray Operating System (COS) and 30 run the proprietary Cray Time-Sharing System (CTSS), an indication that there is much room in Cray's user base for migration to UNICOS. And currently, the three Japanese suppliers—NEC, Fujitsu and Hitachi—offer only proprietary operating systems.

And Cray may be able to capitalize further on its

Chart illustration: Chuck Mackey

initial UNIX advantage, depending on what enhancements NEC incorporates with its UNIX offering. "If NEC brings up pure UNIX [a basic version without extensions], it's going to be a problem for people who run supercomputer centers," says Chuck Fox, assistant director of the San Diego Supercomputer Center (SDSC), citing accounting and job management problems with pure UNIX.

U.CAL.'S SUGAR says the Japanese must follow the UNIX route in the U.S.

For some users, any version of UNIX is a good version. "U.S. companies are going to UNIX rapidly, and I think the Japanese have to do the same," adds Robert Sugar, professor of physics at the University of California in Santa Barbara. "It's going to be a great day for me as a user if everyone settles on one operating system. And I don't care which one it is."

The vendors probably don't either. Having achieved considerable penetration of its user base with UNIX, Cray isn't about to stop now. That means HNSX doesn't have much choice if it's ever going to hit a U.S. home run. So the company's running native UNIX on an NEC SX-2 in Tokyo and is planning to port it to the SX-X on an arithmetic processor. HNSX is also using the SX-2 to develop UNIX extensions.

Providing the right operating system doesn't mean clearing the applications hurdle, though. Cray seems way ahead in this area, although Dataquest's Patton is not sure that strength in applications is necessarily money in the bank for Cray.

If the technological issues are complex, the political ones are downright Byzantine. The only U.S. entity barred by law from buying a Japanese supercomputer is the Department of Defense, which must purchase only U.S.-made supercomputers. But that law might as well list every other potential U.S. customer because none has violated a de facto boycott of Japanese machines.

The Political Freeze

The technological implications of such a freeze out of Japanese machines are uncertain, but some feel that users will be put at a disadvantage eventually. "To the extent that we're not importing technology from Japan—such as the Hitachi S-820 line of air-cooled supercomputers, which the U.S. doesn't have—it is to our eventual disadvantage," says Sid Karin, director of the SDSC.

So what's the United States doing about it? Not much. At press time, Japan was among the countries targeted for a "Super 301" trade sanction, the maximum penalty under the 1988 Omnibus Trade and Competitiveness Act. Having lost large chunks of the memory chip market to the Japanese, the United States isn't anxious for a supercomputer sequel, particularly as supercomputers are not only important as a market in themselves but as the means to developing other technologies and products. "It's not a good position to be dependent on your competition for real value added or product differentiation . . . something fundamental to what your customers are trying to accomplish," warned CDC chairman Robert Price at a press conference the day after ETA died.

Despite such protectionist concerns, there is some evidence that the supercomputer political climate

Supercomputer Developments in the Soviet Union

While much of the world focuses on the supercomputer competition between Japan and the United States, developments in supercomputers and related architectures are going on in other countries. And some of the most potentially significant ones, particularly in the space exploration and defense realms, are occurring in the Soviet Union.

When the Soviet space shuttle Buran lifted off last November, an Elbrus-2 supercomputer was used to manage and control the mission. Although not in the Cray class, the Elbrus-2 is just one of 10 major supercomputer developments in the Soviet Union, DATAMATION has learned.

The 10 projects are:

- Continuing research into the Elbrus family of computers at Lebedev Institute in Moscow;
- Research into Cray 1-class supercomputers at the Institute for Cybernetics Problems in Moscow;
- Development of the PS2000 and 3000 vector processors at the Control Problem Institute in Moscow;
- Work on parallel-processing at Moscow State University;
- Research into macro-pipelining architectures at the Institute of Cybernetics in Kiev;
- Development of the MARS-M supermini in Novosibirsk;
- Development of the ES2703 fine grain parallel processor at Radio Engineering Institute of Taganrog in the Ukraine;
- Development of the ES2704 fine grain parallel system at the Informatics Institute in Leningrad;
- Study of array processors, superminis and shared memory techniques, in cooperation with Bulgaria.
- Research into fault tolerant computers, thought to be continuing at the Spaceflight Control Center in Moscow.

While the West is heavily into GFLOPS, the Soviets are just starting to creep into the upper hundreds of MFLOPS. The Soviets have some basic technology problems, particularly in chip technology, that they acknowledge but are working to improve.

Soviet President Mikhail S. Gorbachev's chief scientific adviser, Soviet Academy of Sciences vice president Yevgeny Velikhov, told DATAMATION that the Soviet Union lags behind the West in its ability to mass produce very large scale integration (VLSI) processor and memory chips in the quantities needed to achieve volume production targets.

But Velikhov refuses to concede that the Soviet IS industry is dependent on the West and claims that the technology trade embargoes of the Reagan era have merely driven his country toward greater self-sufficiency.

And they are moving ahead, given the current number of Soviet projects and the Soviets' considerable technological advances since they reduced their reliance on a serviceable but obsolete class of supercomputer called the BESM-6. This ma-

Photograph by Rick Rickman

may be warming slightly. "There's been a lot of discussion about it [the wisdom of keeping out the high-end SX-X44]," says Bob Borchers, associate director for computation at Lawrence Livermore National Laboratory, which has been prevented from obtaining a Japanese machine by the Department of Energy's de facto boycott. That policy is currently under review pursuant to the DOE's commitment to conducting open procurements for its supercomputers. The Japanese will find out next summer if the DOE means what it says when the agency releases its first procurement since the SX-X announcement.

"I'm urging DOE to face the issue up front," says Borchers. "I don't want to have HNSX win the contract and then sit for two years while politics holds things up.

Adds Karin: "The industries that use supercomputers are far more important than [the issue of] who builds the machines. . . . How important it is to have a domestic supplier is open to debate."

Cray Against the World

Meanwhile, the debate about the health of the domestic industry also continues. ETA's death removes one competitor from the supercomputer scene. A prospective competitor on the horizon is IBM, which has invested in Supercomputer Systems Inc. of Eau Claire, Wis., started by former Cray designer Steve Chen in 1988. SSI, however, is not expected to roll out a machine until 1993.

That leaves Cray, which is having both financial and technical troubles. Cray reported a 94% decrease in first-quarter revenues, producing an operating loss of $1 million. On the technical side, problems with the gallium arsenide chips that will power the Cray-3 have delayed its release by about a year. The Cray-3 is now being developed by Cray Research's founder, Seymour Cray, at the company that was split off from Cray Research—Cray Computer Corp. of Colorado Springs, Colo. The Cray-3 is now expected sometime in 1990. Cray Research's upcoming C-90, which relies on silicon-based chips, is also expected next year.

So, whether Cray is considered one company or two, it remains a de facto monopoly in the United States. But perhaps not for long. NEC may be planning to start manufacturing the SX-X family at Honeywell's plant in Phoenix. According to a knowledgeable source, such a move has already been presented by HNSX president Jim Berrett to the Energy Department if the DOE would agree to accept the first SX-X off the line.

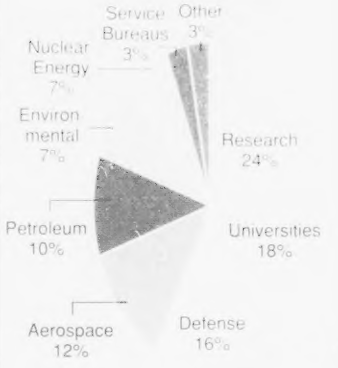
While the conclusion of the supercomputer race may still be an open question, some observers see important implications in the fact that the race has become so close.

"How did supercomputers become equivalent to the snail darter?" asks Samuel Adams, vice president of marketing at HNSX. "Because U.S. companies lost their semiconductor lead, spent nothing on R&D and were satisfied with what they had. It got to the point where critical technology wasn't practical to manufacture in the U.S."

"This is like a relay race," adds Dataquest's Patton. "Japan's won the third leg. The U.S. is going to run awfully damn fast to catch up before the finish line."

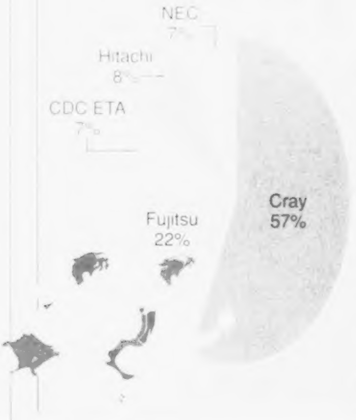
Where Supercomputers Are Used Worldwide

Research institutions are by far the biggest users of supercomputers



Not Surprisingly, Cray Is the Market Leader

But combined market share for the Japanese adds up to 37%



Source: Argonne National Laboratories

chine is the computing backbone of the Soviet's successful manned spaceflight program.

In recognition of the throughput limitations of the BESM-6, development started in 1978 on a 10-multiprocessor system that would be able to offer up to 10MIPS, 10MB of main memory and a word length of 64 bits. Called the Elbrus-1, the computer encountered problems and never went into production. In 1984, the design was changed, and the machine was relaunched as the Elbrus-2. A fully configured Elbrus-2 cluster with vector processors can achieve around 200MFLOPS.

The Soviets loathe revealing production numbers, but DATAMATION's sources have learned that at least 10 Elbrus-2s, and possibly as many as 20, have been installed. One is at the Moscow Spaceflight Center, where it is currently managing the unmanned "Phobos" Mars probe. According to academician Oleg Belotserkovsky, director of the CAD Institute at the Academy of Sciences in Moscow, an Elbrus-3 will show up next year and an Elbrus-4 in 1995.

But the Soviets' most significant moves appear to be in the development of specialized processors and neural computing. Specialized processors, such as the PS2000/3000 and ES2706, can be plugged into a variety of host CPUs. Work on these parallel systems may prove to be the most fruitful of all Soviet developments. But until they cure their manufacturing and semiconductor ills, only the military and space sectors will benefit.

--By DATAMATION correspondents

Muddy Waters

A surprise for Lotus users—dual 1-2-3 upgrade paths—prompts many to revisit their migration strategy. The heretofore undisclosed release 2.2 casts some plans adrift.

BY BOB FRANCIS

Richard Wonnell feels like he's waist deep in Big Muddy as he ponders the new spreadsheet choices before him. As personal computer coordinator for VF Corp.'s Wrangler Division, Wonnell is one of many now reassessing his plans in the wake of Lotus Development Corp.'s decision to launch dual 1-2-3 spreadsheet upgrades.

Wonnell—like thousands of others who waited as Lotus twice delayed upgrades of 1-2-3—is no longer so certain of his company's spreadsheet course. Two upgrades—the long-awaited release 3.0 and a surprise addition, release 2.2—wasn't exactly what anyone had expected.

Wonnell and many other longtime Lotus users say that release 2.2 is the least costly upgrade, but it won't be generally available until September. So Wonnell at the Greensboro, N.C.-based jeans maker, which waited two years for the delayed 3.0 upgrade release, now waits to compare it with release 2.2, a version tailored to the smaller memory size of first-generation PCs. And, Wonnell is by no means alone. Many of the PC and IS managers who made 1-2-3 a virtual corporate standard are midstream in their spreadsheet plans.

"It's a complex and difficult decision," says Jeff Knepper, director of advanced technology at Touche Ross & Co.'s tax division in Washington, D.C. "Before [release 2.2 was announced], it was much simpler. Then, your choices were: stay put, change to release 3.0 or go to a third product. Now, you've got four choices. It makes the decision either very complex or very easy. If all you've got is [first-generation] 8088 machines, it's pretty easy. For those who don't, it's much more complex. Most of us are in that boat," he says.

The two 1-2-3 upgrades create separate versions appropriate to different PCs, depending on the nature of their microprocessors and graphics adapter support. Lotus is targeting release 3.0 for relatively newer PCs incorporating the Intel Corp. 80286, 80386 and 80486 microprocessors. Release 2.2, which contains some new ease-of-use features and other enhancements, accommodates the smaller memory size of first-generation PCs.

File Formats Differ

But, there are other considerations. Architecturally, release 2.2 is a direct successor to the widely used version 2.01 and is compatible with the hundreds of third-party add-in packages. In contrast, release 3.0 is written largely in the portable C language. Although compatible with the 2.01 version in terms of data and functions, release 3.0 includes a new file format that prevents it from being used with existing 1-2-3 add-in packages. However, the 3.0 version has an extensive set of application interfaces called the Lotus Add-In Toolkit (formerly known as Lotus Extended Application Facility). The toolkit lets spreadsheet, data base and other packages supporting the toolkit interfaces function as unified applications.

Such differences have muddied the waters for IS managers interested in upgrading immediately. "We're asking ourselves, What features will Lotus release 3.0 have? What will release 2.2 have? You can't really tell . . . until you put them to use, play with them and see what they do. So, right now, I'm simply waiting," Wrangler's Wonnell says.

Many larger companies are putting off the choice, agrees Mary Spark, a product manager for Corporate Software Inc., a Westwood, Mass., PC software distributor. "The evaluation cycle will be somewhat delayed for the need to look at both products at the same time," she says.

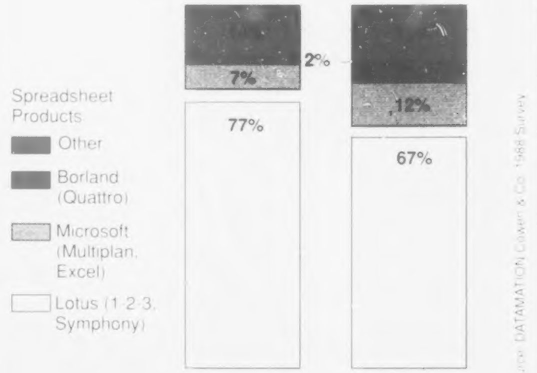
The question of add-in support and the hefty memory requirements of release 3.0 suggest that its appeal will be restrained—at least for the near future. Frank A. Ingari, Lotus vice president and general manager of the PC Spreadsheet Division, declines to comment on sales expectations for the two upgrades. However, he says: "We don't see [release] 2.2 as release 3 junior. . . . release 2 will live a long time. Those 6 million [first-generation PCs] won't go away." Furthermore, Ingari says, the new toolkit interfaces may not be permanently excluded from release 2.2. "There is the question of resource allocation," says the Lotus executive.

The parallel development of releases 2.2 and 3.0 suggests that separate upgrades may only be a temporary response to the heightened com-

In a Down Direction

Lotus 1-2-3's market share was expected to decline, according to a survey of DATAMATION readers conducted before the dual upgrade announcement.

% OF RESPONDENTS USING A PARTICULAR SPREADSHEET PRODUCT



Source: DATAMATION/Cowen & Co. 1988 Survey petition surrounding 1-2-3. Although Microsoft Corp.'s Excel spreadsheet already offers fancy graphics, it also requires the more expensive, second-generation hardware. And, although Bor-land International Corp.'s Quattro runs on first-generation PCs, it does not offer the same sophisticated graphics of Excel or of 1-2-3 release 3.0.

OS/2 Is Behind Two Versions

Lotus hadn't initially planned on the dual upgrade. "Really, release 3.0 was first considered as an OS/2 product. When we saw that OS/2 was not going to take off as quickly as some early projections indicated, we began preparing it for a DOS platform, as well," says Chris Randles, senior product manager for 1-2-3. Still unclear is the ease of upgrading from release 2.2 to release 3.0. For instance, Lotus expects most add-in software developers to create separate versions for 3.0. Even so, Lotus has disclosed neither a policy nor pricing for upgrading its own add-ins from 2.2 to 3.0.

Lotus currently accounts for about 77% of all PC spreadsheet installations, according to the DATAMATION/Cowen & Co. 1988 Mini/Microcomputer Survey. However, that same survey projects a decline to a 67% share by the end of this year, while predicting that Microsoft's market share will rise from 7 to 12%, and Borland's share will triple from 2 to 6%, according to the summer 1988 survey of IS managers. (See "The Purchasing Outlook," November 15, 1988, p. 18.)

Yet, for those who abandoned 1-2-3 for other spreadsheet suppliers, it's not been all wine and roses. "We're in the process of changing our spreadsheet, or at least wanting to change our spreadsheet, but it's very difficult to discard that investment in Lotus 1-2-3," says Jake Parrott, end-user computing supervisor at Food Lion Inc. of Salisbury, N.C.

Food Lion recently designated Quattro as the corporate standard for PC spreadsheets. However, not all the company's users accept the change. "Some of the people in our analytical group are not happy with some parts of Quattro. It's like Lotus is a part of their PC, not just a software package," he says.

Still, Parrott says, Quattro does not force the company to make the hardware choices associated with release 3.0. "We run a pretty tight ship here. Even though we're adding PCs all the time, we're not going to have a wholesale move to 286 or 386 machines unless it's cost justified from A to Z," he says.

Hardware Upgrades Expensive

The issue of hardware upgrades isn't confined to Lotus, says Touche Ross' Knepper. "Excel would trigger a platform change . . . due to the graphics needed. So, just like [for] Lotus [release 3.0], the decision is not just a software issue. If you've got to buy a [Video Graphics Adapter] or [Enhanced Graphics Adapter] display, a mouse and get those working, it gets to be expensive, and it gets to be complex," he says.

"You're not just going out and buying a new piece of software anymore, you've got to commit to the right hardware as well, and that kicks it up into a whole different realm," says Knepper. From his perspective, the days of standing on the river banks are long gone. ▭

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Point of Access

Having gained control of their corporations' ubiquitous PCs, IS managers are now faced with a resulting boom in on-line data base services that itself is crying out for IS control.

BY LEILA DAVIS

To control access costs, maintain order on their networks and make sure their company is getting the best information, IS managers increasingly are thrust into the role of administrators of external on-line information services, as those services are requested by everyone from chief executives to financial analysts to secretaries.

"We are responsible for maintaining the information structure—the hardware and disks, the software, the PCs, the mainframes and the LANs. So we want to make sure that if a user is going to access an on-line data base, it works as smoothly as we would want our in-house access to work," says Chester Romaniak, vice president of IS for Teleglobe Canada Inc., the huge Montreal-based communications carrier.

"I'm not sure if we will ever take over the management of on-line data bases completely, but access must be controlled," Romaniak adds. "Just as the company doesn't give long-distance dialing capability to everyone, it shouldn't give dial-up access to everyone."

Other IS managers have reported an increase in requests for on-line services that are different from the simple hookups requested a few years ago. Frequently, they say, the user knows the kind of information he or she wants, but no longer has a specific data base service in mind. It is falling more and more to the IS staff to do that research.

Exploring the Options

"We are a lot more involved in on-line services than we were two years ago," says an IS executive at a major securities firm who asked that his name not be used. "There is an increased need from users and increased business requirements. When the user has a need for outside data, it is up to IS to explore the options."

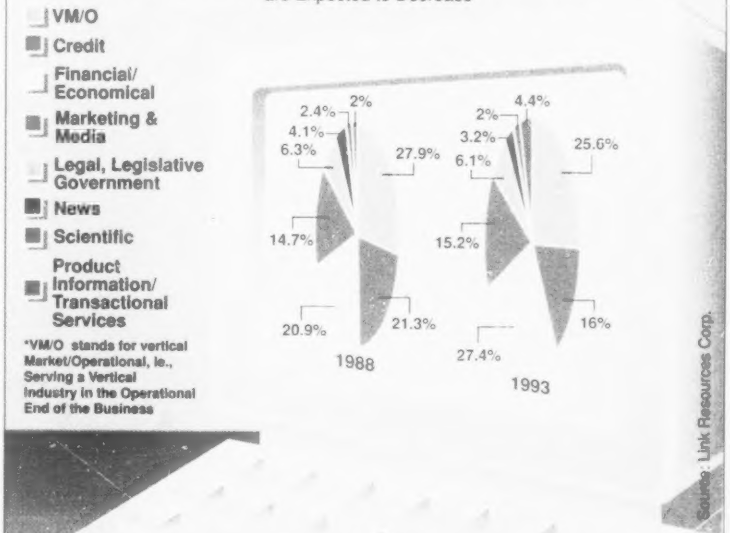
"We work with the user to make the selection. We would point out the technical issues—any technical shortcomings that the nontechnical person would not observe," the securities executive adds. "We look to the vendor to provide user training, but we also make sure that one IS person goes through the training for each on-line service [purchased]. That way, there is always someone in IS who knows the service, can address technical questions to the vendor and can answer user questions if there are problems."

At Central and Southwest Services Inc., an electric and gas utilities company based in Dallas, IS also serves as a clearinghouse for on-line services requests. "We don't decide on the value of the need, but our job is to go about bringing that service into the company. We identify what data bases are available, the user chooses one and we make it happen," says Dick Groff, manager of FIS planning at the utilities company.

"On-line data base services have to come under IS for any number of reasons," says Steven Sieck, vice president

The Information IS Manages

Electronic Information Market Share Projections for 1993 Show Fairly Substatial Incerases in Use of Financial/Economic Data, Conversely, are Expected to Decrease



*VM/O stands for vertical Market/Operational, Ie., Serving a Vertical Industry in the Operational End of the Business

Source: Link Resources Corp.

of electronic services at LINK Resources Corp., a New York City-based on-line services market research firm. "A lot of external information is most valuable when combined with internal information; for example, incorporating external and internal data on one graph. The more external information is integrated into the internal information sources, the more valuable it becomes. Obviously, IS must implement the tools to enable this."

Some companies' libraries still administer on-line services, but with increasing support from IS. At Marriott Corp., based in Washington, D.C., the legal department heavily uses the services of Dayton, Ohio-based Mead Data Central Inc.'s Lexis and Nexis on-line data bases.

For five years, these services were accessible only through a dedicated Mead terminal in the law library, according to library information specialist Elizabeth Wetzel. But two years ago, with the help of Marriott's IS staff and Mead, lawyers, paralegals and administrative staff gained access to Lexis and Nexis through the Wang Laboratories Inc. terminals on their desks. The new setup provides the lawyers with information on case precedents, and provides them with a data base of U.S. state and international laws that would take up too much room in the library in book form.

To avoid overloading the already-stretched legal department network, IS has limited access to no more than three Wang users at any time. The fourth user receives an "access denied" message and can try again later or go to the library.

"Mead came to us with the option of providing access to our Wang systems, and IS installed the Mead software. Our systems people had to modify the software somewhat to accommodate our terminals," says Wetzel. "Then the systems people came up with a set of instructions for the attorneys on how to access the data bases from the Wang computers. Mead did not have any written documentation for the systems, but it did provide the initial training."

Wetzel says members of the systems staff attended the Mead training and are available for emergency questions on access and on problems related to the Wang computers. The library remains responsible for training new users, and billing for the data bases comes to the library.

☐ **COORDINATING ON-LINE ACCESS CAN PROVIDE A COMPANY WITH VOLUME DISCOUNTS.**

IS Can Get Discounts

As for costs, LINK Resources' Sieck points out that as individual PC users accessing numerous data bases proliferate without corporatewide coordination, companies lose opportunities for volume discounts. "The information squires really want to have one point of contact within a company. They don't want to sell information by the drink," he says.

"Coordinating the on-line accesses within a company provides the economic incentives to allow the broadest use," says Sieck. "This doesn't limit users' ability to get the information they need, it enhances it."

Fred Holahan, director of in-house computing products at Interactive Data Corp., a Lexington, Mass., subsidiary of Dun & Bradstreet Corp., agrees. "In brokerage houses, when the individual was procuring services himself, he had no leverage, no discounts for volume. Coordinating access through a company allows IS to use the corporate budget much more wisely," he says.

Indeed, Teleglobe Canada's Romaniak says IS monitors the use of the online services to "evaluate the value we are getting. This way, we can see what we are spending. When we look at the bills, the executives can decide clearly if Dow Jones or any other service is worth what they are paying." Cost control and the appropriate distribution of information are two of Romaniak's main concerns in monitoring on-line services, since the firm has almost as many PCs as it has people. "By the end of next year, we will have achieved almost a one-to-one ratio."

Romaniak also has more immediate technical reasons for taking on some responsibility for incoming on-line data bases. "If you have a lot of users unfamiliar with the on-line procedures sitting at PCs, looking through their instruction books while on line, trying to figure out slash commands, you are very susceptible to system errors. That user can run up a big access bill, freeze his PC and cause problems on the network."

Building Front-End Access

Romaniak's solution is one being implemented by many IS managers faced with the same problem: front-end software interfaces that make access to online services much easier for the nontechnical user. Implementing these tools requires the expertise of IS departments, but can make administering on-line access easier on IS in the long run.

At Teleglobe, eight top managers use a Comshare Inc. executive information system (EIS), and four more are expected to use it within two months. Romaniak's department is developing an EIS specifically on business operations and will eventually develop one for marketing, as well. The firm started out with COMPAQ Computer Corp. 386 PCs and has a few of those in use, but has standardized on the IBM-compatible Packard Bell Co. 386 PCs.

The existing corporate EIS, based on Comshare's Commander EIS software,

Why IS Has Become the Gateway

Steven Sieck of LINK Resources Corp., a New York City-based on-line services market research firm, sees three reasons why on-line services are coming under the supervision of IS managers.

For one thing, he says, "The proliferation of PC LANs means more end users work together, so it is now possible and desirable to leverage the investment in outside services—and in hardware—across those networks."

The second reason is the emergence of the general business user, he adds. Specialty data bases have proliferated and on-line services directories are as thick as dictionaries—and most new users of on-line services are nonspecialists.

Sieck points out that Dow Jones & Co. Inc. of New York City, in its recent annual report, cites a boom in the use of its on-line news service by corporate executives. In the past, such services were more frequently used by librarians or secretaries, and the news items were passed on to the executive in hard copy. With more PCs in use by top management and executive information systems (EISs) becoming more prevalent executives are going on line themselves.

The third factor Sieck cites is the changing information marketplace. Big communications companies looking for other value-added markets are discovering on-line services as new revenue outlets. Sieck predicts regional telephone operating companies will soon be forming partnerships with large on-line vendors to get a foot in the door.

delivers the Dow Jones on-line news service to Teleglobe executives via a set of interfaces readily understood by nontechnical users. Comshare of Ann Arbor, Mich., already had a Dow Jones interface in place when the firm began using Commander.

"We can customize windows, depending on the type of news the executive wants—if he is just interested in specific companies, if he wants more or less detail," says Romaniak. "It makes on-line access very convenient. The executives are comfortable using it [Commander EIS] to access the data base, and it eliminates problems on our system when the user is not familiar with data base commands. The entire EIS takes about 15 minutes of training time for the executive."

A number of Teleglobe's executives have requested Infoglobe, a Canadian on-line news service. Romaniak and Infoglobe are in the process of developing an interface for the service that will be as easy to access as Comshare's Dow Jones interface.

"We have had other requests to add other on-line services too, and we will get to those as soon as we can. Right now, we are concentrating on implementing the rest of the EIS, function by function," Romaniak says. "Our legal department needs direct access to legal data bases—going through the library is too cumbersome for them—so we are considering putting them up on a system. We are getting a lot of requests at the managerial level for more on-line services."

Central and Southwest's top executives also requested more direct, and easy, access to news and stock information that their secretaries had been obtaining for them from The Source of McLean, Va. Groff chose to incorporate the request into an EIS called Easel, from Interactive Images Inc. of Woburn, Mass. Easel has a graphics interface specifically for Dow Jones, called Stockwatch, which provides the executives with the type of access they need.

No CEO Training Time

"You don't get a lot of training time with a CEO, and since we are getting more requests from executives, we are going more toward front-end software tools so they can use the on-line services themselves," says Groff. Right now, the company's top executives use Compaq 386s on a network, using Oracle's data base management system locally and the Easel EIS. Eventually, the system will link to the corporate data base on an Amdahl Corp. mainframe, also running the Oracle data base.

Easel will allow the executives to compare stock information from Dow Jones with in-house performance figures and create graphics incorporating both internal and external data, says Groff. He expects many more requests for this type of service in the future.

These requests add to the general clamor for IS services, and they frequently take priority over other requests—for critical business reasons. However, the time it takes to act on such a request depends on the scope of the request and type of data base needed, say IS managers.

> ☐ **THE MORE A PIECE OF INFORMATION IS SHARED AMONG DIFFERENT USERS, THE MORE VALUABLE IT IS.**

One of those critical business needs is using on-line data as a quality control measure for internal data. In the financial services industry, this practice has increased since the stock market nosedive of 1987, according to Holahan at Interactive Data.

The unnamed securities firm mentioned above receives five different online services, including Datasheet, a data base of pricing and financial data on publicly traded securities offered by Interactive Data. "We use Datasheet to provide corporate action information and foreign security pricing for those involved in the global custodianship of clients' securities," says the IS executive there.

Services Support Company Data

"The Datasheet data is used to support in-house data as a quality check; it is a second source to validate in-house information," says the executive. The hardware and software varies throughout the firm, he notes, but most users work on IBM-compatible PCs in a DOS environment.

"Before the [1987 stock market] crash, a lot of users at brokerage houses had their own PCs and their own budgets and their own individually procured on-line services. The individuals had more latitude before the crash, so they sourced their own analysis tools," says Holahan. "There was no method of standardization, no method in place to defend the investment decisions being made. One person was using one set of analysis tools, and the next person was using a whole different set.

"Management woke up after the crash and saw that standards were needed to make investment decisions. Many brokerage houses have begun to standardize through IS on the on-line services they use for investment analysis," Holahan says.

LINK's Sieck notes a move toward standardization of internal and external data in other industries, as well. "The more the same piece of information is shared among different users, the more valuable it is. This is the role that information can play in maintaining organizational learning on a consistent basis," he says.

The trend toward greater IS control of access to on-line information services is converging with a trend among vendors to become merely suppliers of raw data to their customers.

"Users are beginning to want more control over the data they access. The future trend is for data base vendors and other new information providers to broadcast the raw data to the corporate site to be filtered and organized according to the needs of the organization, rather than being maintained and organized off site," says Sieck.

Interactive Data has developed one such on-line service. Called MarketPlus, the service incorporates a wide variety of global capital-markets data for financial services firms. MarketPlus consists of data, applications and a data base management system. The information is updated as an off-site data base would be, but instead of residing at the vendor location with dial-up access, the data are sent to the user's IBM or Digital host computer for distribution and are updated remotely by the vendor.

"This was created because we saw more involvement by IS. In fact, IS departments were asking us to create it," says Holahan. "They said PCs have run amok, and they see the need to manage both the hardware and the information for it most effectively."

Sieck cites Dow Jones as another example. Dow Jones has announced a network architecture called Dowvision, which will be used to broadcast data to a corporate site in a raw form.

Sending raw on-line data to a customer site could create new opportunities for vendors to assist in packaging that data for various applications, Sieck says. No matter which company or user organization fills that user need, he adds, "One thing is clear. It has to go through IS."

Leila Davis is a freelance writer based in Alexandria, Va.

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SPECIAL REPORT: Fujitsu's Next Stop, World Markets

DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

The New IS Force

Independent Business Unit Managers Are Marching to a New IS Beat

Also in This Issue:
Creating the Open Data Center
The Longer Reach of AppleTalk
Balancing Network Options
The Shock of Going Global

AUG. 1, 1989

VOLUME 35
NUMBER 15

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FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

The New IS Force 18

BY SUSAN KERR The creation of the independent business unit in many corporations has spurred the migration of IS activities to support this business entity. IS pros who have ventured out into the field are finding that life in the business units requires different attitudes toward end users and, often, different technical skills. Some have switched allegiances to such an extent that they grumble about their former colleagues back in central IS, the old "glass house."

The Newest Breed of IS Pro 20

Cover Photography by David Bradley

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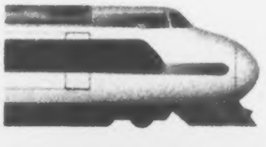

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BY LAWRENCE STEVENS Automated management tools and distributed computing are chipping at the walls around the data center. Yet, even as some positions fade away, DP employees are becoming more—not less—technical.

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BY AVERY JENKINS Apple recasts its AppleTalk protocols for a larger role in corporate networks. Devised for small work groups, the protocol is now being primed to support larger network configurations and connections to other networks.

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BY ROBERT H. RECK Companies that are attempting to globalize their business may send IS shops into a tizzy, but aligning the company's goals and organizational structure with IS strategy may help straighten things out.

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BY JEFF MOAD As companies respond to pressures to decentralize IS and place applications closer to end users, management in some companies is coming up with some creative ways to educate technology-oriented IS staffers about the businesses they are supporting.

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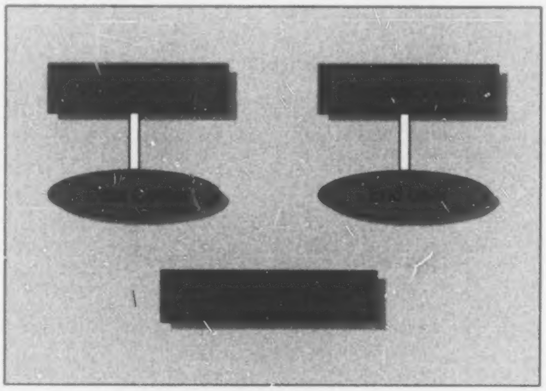
The Correct Perception

Perception is not reality in all cases. The perception that information systems executives and their headquarters staffs are fighting the move toward distributed systems is a myth. Equally fatuous is the notion that workstation-wielding end users don't want or need anything from central IS. In reality, both constituencies—IS execs and their corporate counterparts—understand the benefits and the limitations of managing information on desktop platforms.

Such mutual understanding—the real foundation for corporate computing in the decades ahead—shines through in three separate articles in this issue. Each is written from a different perspective in the corporate-computing environment.

The business unit, where companies fight battles to win and serve customers, is the focus of San Jose bureau manager Susan Kerr's attention in this issue's cover story, "The New IS Force," p. 18. Her reporting goes beyond discussing the advantages of placing responsibility for business-critical applications in the hands of IS professionals located on the front lines of corporations. Most members of this new IS force feel liberated—free to develop and support the systems needed to help their colleagues generate more business for their organizations.



TECHNOLOGY PARTNERSHIPS between headquarters and business units may lead to greater productivity.

The view from headquarters, as seen by senior writer Jeff Moad in "Out of the Glass House," p. 71, is equally liberating. Interviews with the top IS executives from companies as diverse as General Foods USA and Primerica Corp. reveal that organizations are pulling out the stops to educate all of their IS employees—regardless of location—about business fundamentals.

Data centers, too, are growing increasingly aware of their new responsibilities in distributed-computing environments. In "The Open Data Center," p. 55, contributor Lawrence Stevens discovers several IS managers who have invested in the tools and staff needed to handle the complexities created by today's power users.

You should not, however, perceive the expansion of distributed computing to be a mild, orderly event in most user organizations. If anything, the issue has caused a considerable amount of turbulence. At the center of such storms are two questions:

- Are IS executives willing to take charge of building and maintaining the information technology infrastructures their businesses need?
- Are business unit managers ready to assume control of the use of such technology?

If your organization hasn't started answering these questions, it had better begin before competition forces it to do so.

Currency Excess Drives Foreign Success, Right?

Another misperception concerns major Japanese IS suppliers. It's not, in most cases, a swollen currency that's giving Fujitsu Ltd., Hitachi Ltd., NEC and others so much of their new muscle. Their might derives from meaningful, long-term strategies combining technology, customer care and, yes, aggressiveness. Senior writer Moad discovered as much during a week he spent in Tokyo interviewing executives and customers of the world's number three IS supplier, Fujitsu. His findings are the subject of our special report, "Next Stop, World Markets," on p. 28.

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Tim Mead, Editor-in-Chief

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Next Stop, World Markets

The world's number three information systems company is speeding ahead with plans to expand its presence in the United States and Europe. But will its strategies play in Peoria or Paris?

BY JEFF MOAD

From his 20th floor offices above Tokyo's downtown Otemachi district, Fujitsu Ltd. president Takuma Yamamoto can look directly down on the city's central railroad station, where Japan's aptly named bullet train makes its daily stops before pressing on to Kyoto and points beyond.

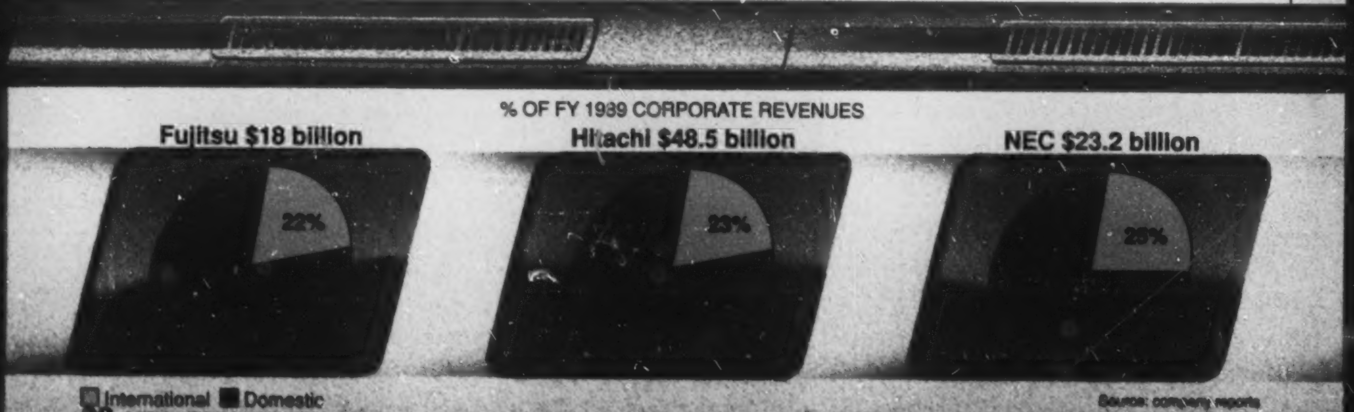
Like the world famous blue-and-white train whooshing along at 200-plus miles per hour, information systems hardware and software vendor Fujitsu—with Yamamoto at the controls—has accelerated to impressive velocities. Ten years ago, Fujitsu surpassed IBM as Japan's top IS vendor. The company hasn't looked back since. Combining impressive hardware technology with aggressive sales, marketing and customer support, Fujitsu has managed to widen its lead in Japan. More important, it has emerged as the world's number three IS vendor—trailing only IBM and Digital—after a fiscal year that saw its global IS revenues climb 15% to $11.95 billion. Fujitsu's corporate revenues were just over $18 billion for the 12-month period ending March 31.

Now there is mounting evidence that Fujitsu is putting together plans to become a force not just on its own turf but also internationally. In the wake of an arbitrated settlement last year with IBM, which removed a legal cloud that had been hanging over the company, Fujitsu tested the tracks outside Japan with renewed vigor. The company has:

- Invested heavily in open systems technology, a key to unlocking Western doors.
- Started direct sales subsidiaries in some countries on a trial basis.
- Established a systems-engineering and support beachhead in the United States.
- Expressed behind-the-scenes interest in acquiring major U.S. software companies.
- Acknowledged, in recent interviews with DATAMATION, that it wants to market Fujitsu-labeled

Fujitsu Rides on Domestic Tracks...

As do Japan's other IS engines.



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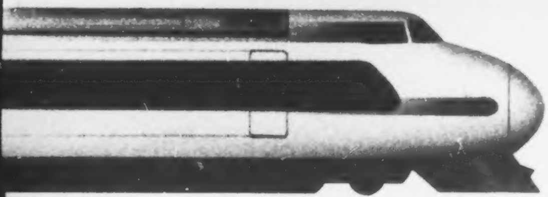


Fujitsu has emerged as the world's number three IS vendor, trailing only IBM and Digital.

midrange systems and operating systems more aggressively outside Japan.

Such actions raise the possibility that IS executives worldwide will soon have a major new alternative to the current crop of vendors, products and services on which they've been building their enterprises. But it's just that—a possibility—unless Fujitsu clears the obstacles in its way toward becoming a truly global IS force.

What Stands in Fujitsu's Way

Fujitsu is saddled with several different, incompatible proprietary architectures. It hasn't created a complete solution for users wanting a single, consistent distributed development and production environment. It's hemmed in internationally by some of its existing marketing relationships—with Amdahl Corp. in the United States and with Siemens AG in Europe. And its mainframe heritage could prove a hindrance.

In Japan, Fujitsu has built its strength on strong mainframe hardware and on an ability to develop close, long-term relationships with a set of relatively conservative, mainframe-oriented users. In Europe and the United States, Fujitsu will face a much different situation. There the trend is toward distributed applications built around local area networks, a consistent development environment, quick new application turnaround times and integration services that focus as much on matching applications to business requirements as on development methodology and coding.

Nevertheless, Fujitsu is clearly aiming to increase its international presence, which to date has been less than impressive. The company's overseas IS sales (not counting semiconductors or telecommunications) total $2.4 billion—slightly more than 13% of Fujitsu's total corporate revenues of $18 billion.

If the company's internationalization efforts fail, that could have serious implications for Fujitsu's customers—even those in Japan. The biggest impact might be in the area of research and development: Fujitsu needs new sources of revenue growth to feed its insatiable R&D appetite. "I don't know how long we can endure this," says Masaki Ogi, president of Fujitsu Laboratories Inc., referring to the fact that the company's R&D spending is growing faster than sales. The company now is devoting about 13% of its revenues to R&D.

"They're clearly not satisfied with their international business right now. And they seem to be making moves to improve it," says Yuji Ogino, managing director of International Data Corp. Japan Ltd. Analysts in the United States seem to agree. According to Bob Djurdjevic, president of Annex Research in Phoenix, "Fujitsu wants to do a lot more internationally, and they may well need to go beyond their current business relationships to accomplish that. I wouldn't be surprised to see that very soon."

Yamamoto clearly isn't overjoyed with Fujitsu's international IS business today. "I wouldn't say we're comfortable with the growth of our international business, but it's in the range of comfortability," says Yamamoto diplomatically. Over the next few years, he adds, "Fujitsu's activities worldwide will be expanding. . . . There will be joint activities, such as establishing new companies and tying up with corporations abroad."

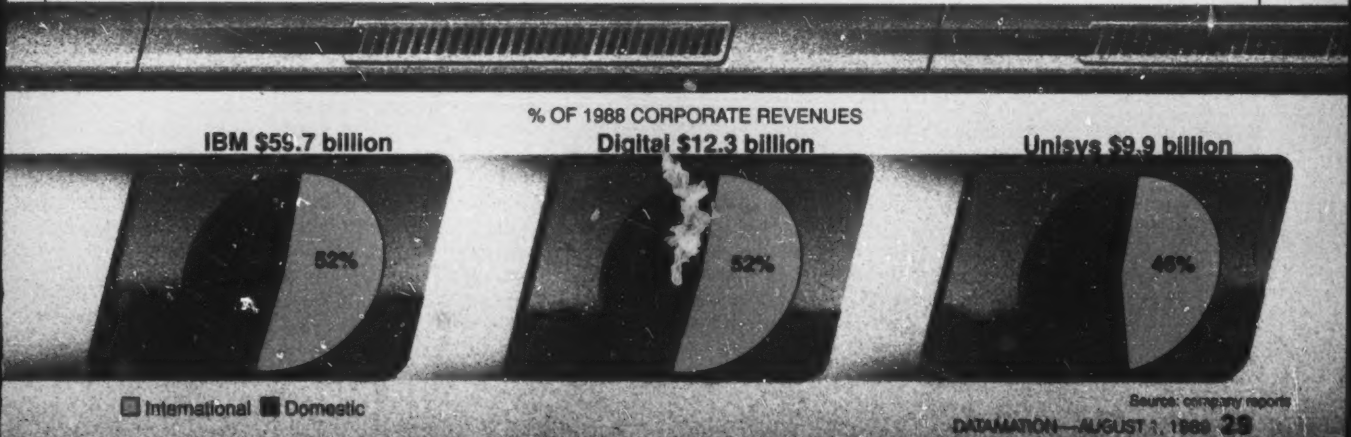
U.S. Strategy Goes Beyond Amdahl

Fujitsu already has one successful marketing channel in the United States for its largest mainframes, the 100-plus MIPS Facom M780 system. The Japanese company owns 45% of Sunnyvale, Calif.-based Amdahl, which markets its own IBM-compatible version of the M780 as its 5990 family. The 5990 has been Amdahl's most successful mainframe to date, boosting the California company to $1.8 billion in sales last year.

Fujitsu officials are quick to say they have no plans either to buy more of Amdahl or to seek new U.S. marketing deals involving their largest mainframes. Midrange systems are another matter, however. Fujitsu is finally ready to think about bringing its

While U.S. Rivals Travel Worldly Routes

IBM's Asia/Pacific business is the company's fastest growing area.



Source: company reports

full product line, which consists largely of proprietary systems, to international markets. Asked recently by DATAMATION if Fujitsu is looking for a partner to help market its midrange systems and systems software in the United States, the company's executive director for information processing systems, Shiochi Ninomiya, said, "I won't deny it."

AIRLINE CUSTOMER ASHIGAMI: Fujitsu assigned 50 programmers to his expert system application.

Recently, Fujitsu took a big step toward enhancing its international position by announcing a new operating system, which is essentially compatible with IBM's MVS/XA. The new Fujitsu operation system, called MSP Extended System Architecture, will not only support IBM languages, such as VS/FORTRAN, but also major IBM subsystems, such as CICS and DB2. Currently, Fujitsu's mainframe operating systems only simulate the functions of IBM's operating systems and subsystems. Fujitsu's announcement followed last year's resolution of IBM's charges that Fujitsu violated its intellectual property rights in designing its earlier operating system software. Fujitsu announced the new operating system only in Japan and Australia for shipment about a year from now. The company says it has no immediate plans to introduce the product in the United States.

Fujitsu isn't the only major Japanese IS vendor plotting escalated international efforts. Late last year, rival Hitachi Ltd. joined with Electronic Data Systems Corp. (EDS) to acquire U.S. mainframe distributor National Advanced Systems Corp. (NAS) from National Semiconductor Corp.

> I'd view it as a positive if Fujitsu entered the market. The more players and the more competition, the better.
>
> **James Marston**
> **American President Cos. Ltd.**

Hitachi's recent acquisition of NAS made Hitachi the first large Japanese IS vendor to take a direct controlling interest in a major U.S. systems subsidiary. Fujitsu officials, however, insist the move by their Japanese rival hasn't had an impact on their company's international IS marketing plans.

In fact, Fujitsu had already started expanding internationally well before the Hitachi-EDS deal was announced. In addition to stepping up its search in the United States for packaged software to run on its mainframe and midrange systems, Fujitsu last year quietly established a systems engineering beachhead in Santa Clara, Calif. Its mission is twofold: to scout out software from independent U.S. software vendors that can be ported to Fujitsu hardware and to provide support services to the U.S. operations of large Japanese customers.

Perhaps as a result of its new U.S.-based systems engineering efforts—called Fujitsu Systems Engineering of America Inc.—Fujitsu has been rumored to be a possible suitor for large U.S. software concerns.

Although no Japanese company has yet acquired a major U.S. software concern, some U.S. observers feel it's only a matter of time. "The Japanese have always been superb at hardware design and manufacturing. But now they are realizing that the software content of systems is becoming a larger part of the whole and that hardware is in danger of becoming a commodity," says Bernard Goldstein of software consultancy Broadview Associates of Fort Lee, N.J.

Fujitsu in Focus

The company is spending more on R&D than ever before.

Worldwide revenues: $18.09 billion
Net income: $530 million
IS revenues: $11.95 billion

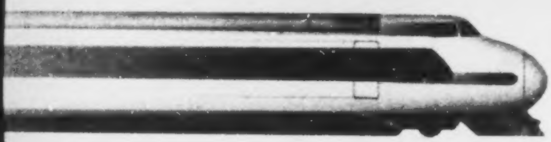
Major product lines:

- Mainframes: Facom M780
- Midrange: M760, M730, K series
- Workstations: 9450 series, Sigma, SPARC- and 68000-based systems
- PCs: OS/2 systems, proprietary MS-DOS systems

Porting packaged software to its Facom hardware would be a prerequisite to any serious direct assault by Fujitsu on U.S. or European markets. But it would also help Fujitsu at home, where a historical preference among users for in-house or custom-developed applications is slowly giving way to an acceptance of packaged applications.

One U.S. software company hoping to cash in on Fujitsu's expanded international-marketing plans is On-Line Software International Inc. of Fort Lee, N.J. With the support of Fujitsu and its Japanese distributors, On-Line is currently in the final stages of porting its Ramis fourth-generation language and U.F.O. computer-aided software engineering tools to the Facom environment. According to On-Line executive vice president Rick Holtmeier, engineers from Fujitsu Systems Engineering in Santa Clara have been unusually helpful to On-Line engineers. He says On-Line is spending close to $1 million to port its products to the Facom environment because, he believes, the move will expand On-Line's market not only in Japan but also in other markets, including the United States. "They haven't said anything to us about it, but, based on what Fujitsu is doing in Santa Clara, we think they're about to make some kind of move into the U.S. market," Holtmeier says.

Fujitsu already has moved ahead in several other foreign markets, increasing its direct-marketing



Fujitsu's mainframe heritage is ill suited to the distributed-processing needs of U.S. users.

presence in several regions. In Spain, Fujitsu recently formed its own direct sales subsidiary similar to the ones it has established in Brazil, Hong Kong and Singapore. And in Australia, the company last fall established an applications center to develop custom solutions for Australian users.

How Programming and Open Systems Fit In

If Fujitsu's approach to the technical aspects of systems engineering and customer support in Japan is any indication, users in Europe and the United States could benefit from an expanded Fujitsu presence.

In Japan, where experienced programmers are in short supply, many large users rely heavily on hardware vendors like Fujitsu for help in developing applications. All Nippon Airways Co. Ltd., for example, recently implemented an expert-systems-based flight-scheduling application executed almost entirely by Fujitsu systems engineers. According to airlines MIS development manager Akihito Ashigami, Fujitsu put 50 programmers on the project. which included data base, graphics and office automation elements, in addition to the expert-scheduling system. In addition, Fujitsu keeps engineers on hand full-time to maintain the application.

That kind of hand-holding support approach could sit well with U.S. users, many of whom are looking to off-load some development responsibilities to outside vendors or systems integrators. "I've been impressed with the little I know about them [Fujitsu]," says James Marston, chief information officer at the shipping company American President Cos. Ltd. in Oakland, Calif. "I'd view it as a positive if they entered the market. The more players and the more competition, the better."

Marston is apparently just the kind of large U.S. user Fujitsu would like to woo. Fujitsu recently contacted him and several other U.S. CIOs with an invitation to come to Japan and learn more about it.

Another area in which Fujitsu is clearly targeting overseas users is open systems. In the past few months, Fujitsu has positioned itself as the open systems leader among Japanese systems vendors. The company was the first Japanese vendor to join the X/Open Co. Ltd. consortium, a group of 19 systems companies at the forefront of the open systems movement. Fujitsu is also a member of the AT&T-affiliated UNIX International open systems effort. And it has marketing and technology-licensing agreements with Amdahl and Sun Microsystems Inc. Fujitsu manufactures Sun's SPARC reduced instruction set computing (RISC) chips and resells Sun workstations. The company has also ported Amdahl's UTS mainframe UNIX operating system to its largest Facom systems.

"We sincerely hope there is a strong standard such as OSI [open systems interconnection]," says Fujitsu president Yamamoto. "But we also have to look for a second-best solution such as X/Open and UNIX International. We are willing to cooperate in their development."

Fujitsu's keen interest in open systems has blossomed despite limited active user interest in open

Fujitsu's Old Foe Goes on the Offensive

While Fujitsu Ltd. attempts to increase its IS business overseas, inside Japan, the company is facing renewed competition from an old rival—IBM.

In recent months, IBM has gone on a market share offensive—trying to make up some of the ground it lost in the mid-1980s to Fujitsu and NEC. Big Blue is offering large users significant price discounts. It is merging its Japanese workstation, the 5550, with its high-end PS/2 workstations. And it is introducing its midrange AS/400 system in Japan. IBM has even begun marketing hardware options that make its 3090 mainframes compatible with Fujitsu's and Hitachi Ltd.'s large systems.

As a result, IBM's computer business in Japan last year increased by more than 14% to about ¥1.2 trillion (about $9.1 million at ¥132=$1). Its share of the installed base of large systems in Japan climbed from 27% to 29%, according to a leading Japanese computer publication, *Nikkei Computer*. Although IBM continues to lag behind both NEC and Fujitsu in the Japanese midrange systems market, the company has solidified its number two position in personal computers behind NEC. IBM, according to *Nikkei*, this year holds nearly 22% of Japan's PC market—up from 12% two years ago.

"IBM has been becoming more aggressive in off-list pricing over the last 18 months, in some cases offering up to 30% off list prices," says Yuji Ogino, managing director for International Data Corp. Japan Ltd. in Tokyo. IBM continues to insist on an exchange rate that values the dollar at up to double the going rate. But, Ogino says, the discounts have helped, as has the growing popularity in Japan of IBM's DB2 relational data base management system and packaged decision support application software.

An IBM spokesman acknowledges the company's exchange rate policy, as well as its recent aggressive discounting practices. "It's very expensive doing business in Japan, and the level of maintenance and support that is expected is very high," he says. Nonetheless, he adds, the company is able to offer volume pricing agreements to large customers.

Whereas that pricing aggressiveness seems to be paying off, IBM's efforts to attract Fujitsu and Hitachi customers with compatibility options so far has not. The IBM spokesman was unable to identify a single Fujitsu customer that has jumped at IBM's Facom-compatibility option, which enables users to run applications built on Fujitsu's mainframe operating system on IBM machines. "So far, the number is very small. It's a gradual thing that will be important only as users think about upgrading," he says.

Meanwhile, Fujitsu executives don't seem too concerned about IBM's compatibility efforts. "It's natural to expect IBM to get into the Fujitsu-compatible business in Japan," says Fujitsu's marketing group general manager Tadashi Sekizawa. "That means that from now on we have to focus on ways to differentiate our products. One such way is to add new features, proprietary features. A second is to provide better total support. IBM has begun offering compatibility, but so far we have been very good at competing with IBM."

Fujitsu has positioned itself as the open systems leader among Japanese IS vendors.

systems or in UNIX for commercial applications. While Japanese users like Yuzuru Abe, general manager of systems and operations planning at the massive Dai-ichi Kangyo Bank Ltd., say that in the long term they plan to implement OSI and open systems, for now they seem closely wedded to proprietary architectures and slow to change.

Dai-ichi Kangyo, the world's largest bank, for example, mixes proprietary Fujitsu and Hitachi hardware and software in its systems architecture. The bank recently completed a new Fujitsu-based suite of applications for transaction processing, which took six years and 40,000 man-months to develop. Abe says it has taken the bank 10 years to migrate most of its programming from assembler to high-level languages like COBOL and PL-1.

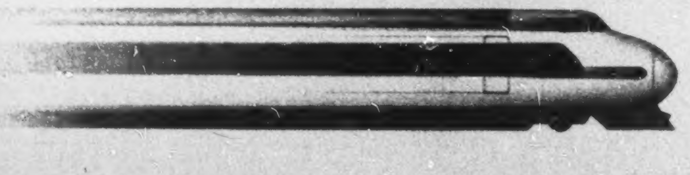
DAI-ICHI KANGYO'S ABE: The world's largest bank just completed a suite of Fujitsu-based transaction-processing applications that took six years.

Given the slow rate of change among Japanese users, Fujitsu officials acknowledge that their open systems efforts are primarily focused on markets outside Japan. "Yes, our interest in UNIX is mainly for international markets today," says information systems executive Ninomiya.

Similarities With IBM

In many respects, Fujitsu's challenges both abroad and at home parallel those of its number-one competitor, IBM. According to Yamamoto; "Today, our business is heavily dependent on the mainframe business. But in the near future we'll have to go down to workstations and personal computers. We have to expand those areas, but it's a very difficult area [in which] to make some progress."

Like IBM, Fujitsu's historical dependence on proprietary mainframe systems has left it with a patchwork of proprietary, incompatible systems and a connectivity strategy that is still largely in the planning stage. Fujitsu sells three mainframe operating systems in Japan, as well as one mainframe line manufactured only for its largest customer, Nippon Telegraph and Telephone Corp. In addition, the company sells an incompatible small-business system architecture and a separate minicomputer architecture. Fujitsu supports four different workstation architectures—including the SPARC design and one based on Japan's Software Industrial Generalization and Maintenance Aids (SIGMA) project. And Fujitsu now has a pair of personal computer architectures, one a proprietary implementation of MS-DOS, the other a recently introduced OS/2 system.



Fujitsu, in fact, was slow off the mark in the Japanese PC market. It trails market leader NEC by a considerable margin and number two IBM by a smaller but significant amount. Fujitsu also seems to have fallen behind in data base technology. Users describe the company's key mainframe data base management software as a nonrelational product, and Fujitsu has yet to come out with a relational data base management system based on Structured Query Language (SQL). However, the company is expected to do so later this year.

Not surprisingly, Fujitsu is attempting to reconcile this diversity of architectures with a common set of languages, interfaces and services much like IBM's System Application Architecture (SAA). Fujitsu calls its approach System Integration Architecture (SIA). Many Japanese users already committed to Fujitsu welcome SIA, although Fujitsu has just begun to define it. Internationally, however, observers say large users would be unlikely to accept a new architectural alternative to SAA and OSI.

A Need for Systems Analysis

Fujitsu executives also acknowledge that the company needs to upgrade its approach to systems integration and applications development support both in Japan and internationally. While Fujitsu is very good at providing users with programmers and programming tools, the company hasn't developed the kind of business-driven systems requirements analysis skills that users increasingly demand.

"Lots of companies in Japan are willing to provide users with programmers relatively inexpensively. Fujitsu is one of them," says Ronald L. Cullum, a partner with Arthur Andersen Consulting in Tokyo. "But nobody's really approaching it from the point of view of solving business problems and implementing solutions—the kind of thing users in the U.S. are demanding." Recently, says Cullum, Japan's Ministry of International Trade and Industry (MITI) criticized Japanese vendors for their implementation-only approach to systems integration.

Japan's largest systems vendor obviously has a lot of work to do before it can establish itself as a major international IS force. Fujitsu officials, however, clearly believe they have something to offer IS users outside Japan. "In Japan, we provided the first support for Japanese language features, and 22 years ago we were the first to provide minicomputers with a COBOL compiler," says Yamamoto. "As a leader in the industry, we plan to continue making such contributions." ▭

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CAREERS IN CRISIS

Managers Question Their Future as Change Grips the Profession

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CASE vs. 4GLs

What Smart PC Buyers Want

Streamlining Network Memory

Wringing Value From Old Systems

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The Winds of Change Blow Hard

Psychologists tell us that some of the most profound events in life and those with the most far-reaching personal implications are the death of a parent or loved one; marriage; and major career changes, including the loss of a job. Certainly, such profundity is much in evidence these days in the IS industry. With many central IS sites breaking up, many IS activities being off-loaded to outside vendors and new organizational entities such as independent business units forming, these are indeed tumultuous times for IS professionals on all rungs of the career ladder.

At the top, so-called chief information officers may be feeling the full force of the winds of change. According to the second annual Coopers & Lybrand/DATAMATION survey of top IS leaders, 64.7% of CIOs say the biggest obstacle to fulfilling their role is cultural resistance, and another 47.5% indicated that uncertain job expectations is a major worry.

But the changes are being felt not only at the top. Others, writes senior writer Ralph Emmett Carlyle in our cover story this issue, "Careers in Crisis," page 12, have been reduced to the status of unhappy out-of-work pros who are trying to figure out how and where they fit in today's IS world. Some, though, have found ways to adapt. "Some of the IS pros displaced in the off-loading trend are going to work for the outside vendors themselves," Carlyle says. "For some, the shift can be positive. They could gain stock and benefits in a thriving professional services company and more varied work assignments."

Photograph by Dave Bradly

HARVARD'S DEARDEN: Warns about turning IS into a profit center.

Whatever the outcome for individuals, the one certainty is that the profession has changed—and changed irreversibly. IS managers cannot go back. But, the key to coping with this change, writes Carlyle, will be in recognizing not whether there are opportunities in IS but where they are and where they will be in years to come.

The Fate of Fourth-Generation Languages

Next up is a story about the impact of computer-aided software engineering technology on fourth-generation languages. In "CASE vs. 4GLs," page 29, freelancer David Stamps says that 4GLs are still useful, but over time these high-level languages will have a different role to play. Tune in to our story for the verdict on 4GLs.

Also on the docket this issue is some street-smart advice for all the PC buyers out there in IS land. Dallas bureau manager Bob Francis and assistant editor Jane Majkiewicz report in "What Smart PC Buyers Seek," page 49, that sharp buyers are focusing more on functionality, reliability and compatibility than ever before. So, keep checking those prices to find the best deal, but don't be blindsided. There's more at stake than the price tag.

David R. Brousell, Executive Editor

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A Conservative IS Spending Approach

The latest IS survey by DATAMATION and Price Waterhouse reveals that executives are being particularly cautious about spending.

Nearly 60% of major computer users are holding the line on information systems spending for the remainder of the year. For every two IS executives planning to increase or decrease their outlays for hardware, software, staffing and the like in 1989, three indicate that their IS budgets will remain unchanged compared with last year, according to a recent survey by DATAMATION and the New York City accounting firm Price Waterhouse.

These budget-conscious IS executives are so on top of spending that they no longer rank cost containment as a major issue. The 750 IS executives surveyed in this latest DATAMATION/Price Waterhouse survey rank four other challenges ahead of budget matters: meeting deadlines; predicting the impact of new information technology on their businesses; systems and program maintenance; and communications integration.

Although the survey reveals heightened interest in distributed processing, it's barely enough to put the hardware demand picture in a positive light. The 44% of IS executives who indicated that their hardware spending will increase this year is almost exactly balanced by the 43% who said that their equipment budgets will remain unchanged. And, a full 13% of IS execs are chopping CPU outlays.

For applications software, spending will stay the same for 52% of survey respondents, decrease for 11% and rise for 37%. Of the users with plans to increase applications investments, most employ between 500 and 10,000 workers—indicating that larger companies are swallowing their second helping of applications software with fewer problems than they did their first course. The biggest investors are manufacturing companies.

Financial and information firms are joining universities, research houses and utilities in keeping systems software purchases level. Since the main elements of systems software activity relate to operating systems, data base management software, access and control software, teleprocessing monitors and communications controllers, the survey suggests that many user organizations have completed initial efforts to install such software.

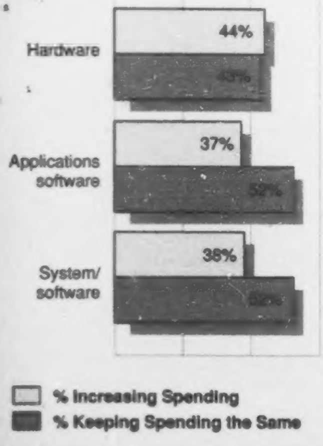
The conservative IS investment approach is just as obvious on the staffing side of the cost equation. Only one out of five users surveyed is planning to increase outside IS staff and services.

Being a member of an inside IS staff may be no bed of roses either. Several user organizations with between 1,000 and 10,000 employees seem to be embarking on a salary policy that provides annual increases of up to only 5%. Smaller users seem much more generous, planning IS pay raises of between 5% and 20%. The different approaches to compensation suggest that in large companies, where technology probably has stabilized, the desire to pay top dollar for systems and programming people has diminished. Conversely, small companies whose rapid growth heavily depends on increasing use of systems still seem willing to pay a premium for programming talent. ▭

Conservative IS Stripes

Users are keeping their costs in check.

IS Executives' Spending Projections for 1989



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INTERNATIONAL EDITION/SEPTEMBER 1, 1989

Cooperative Processing Part 1: The Host Perspective

DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

Also In This Issue:

Expert Systems Success Models

Banking on I.S. Careers

Digital PBXs: Giving Voice to Applications

User Power Grows on Standards Strength

SEPT. 1, 1989

VOLUME 35
NUMBER 17

DATAMATION®

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

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Cover Photography by David Bradley

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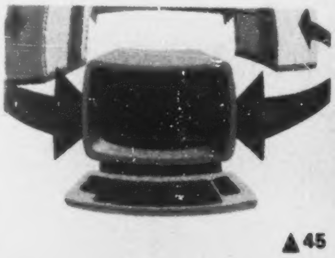

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INSIDE DATAMATION

Some Answers to Complex Problems

Complexity needs to be managed more carefully than any other aspect of a major systems undertaking. Yet sometimes it is overlooked by information systems managers and business executives—as well as their suppliers—in the haste to build and enhance information technology infrastructures that will support their organizations. The builders aren't guilty of neglect or ineptitude. They're just too concerned with technology choices, cost analyses, development schedules and other facets of significant IS projects to assess how to best manage the complex tasks before them.

Such oversight almost can be excused given what's already expected of today's IS decision makers. They're being asked to make hardware, software and communications investments and manage human resources in an era of unprecedented change in nearly every sphere they influence—macroeconomic (globalization), microeconomic (decentralization, mergers and acquisitions) and technology (distributed processing).

Photograph by David Bradley

TUMULTUOUS HISTORY: WWMCCS' difficulties go back nearly 20 years.

But such oversight can be devastatingly costly, as demonstrated in this issue's cover story, "The Pentagon's Botched Mission," p. 22. Washington bureau manager Willie Schatz's tale of woe about a $400 million information system critical to the defense of the United States—the so-called World Wide Military Command and Control System (WWMCCS) program—provides a valuable lesson for any IS team charged with developing a massive system. "[It's] a case study in nearly everything that could go wrong with an IS project," Schatz writes, "poor communications with users, improperly designed specifications, missed deadlines, budget cuts—to name the most prominent problems."

Rather than continue to mismanage the complex project, Washington has shifted management for WWMCCS, reduced its scope, relied more on off-the-shelf software and delegated most of the technologically insignificant buying decisions to users.

Profiting From Experience

The private sector has had its share of failures in complex systems development, too. In "Expert Systems Success Models," p. 35, contributor Marc Meyer, a professor at Northeastern University in Boston, identifies two user organizations that have learned from others' mistakes in the field of artificial intelligence. The savvy AI students are Lincoln National Reinsurance Cos. and Stone & Webster Inc. In "Banking on Integration," p. 31, contributor Lawrence Stevens discovers how two leading U.S. banks, Exchange National Bank of Chicago and Banc One Services Corp., have turned the dismal results posted by other banks in large scale integrated systems development into profitable IS gains.

Computing models (aka architectures) and standards are perhaps the most visible signs of a world struggling to manage complexity. That's why there's so much interest these days in cooperative processing, the subject of a three-part series that begins in this issue with our San Jose bureau manager Susan Kerr's story, "The Host Perspective," p. 45. The different models for such processing rely on standards—whether promulgated by a dominant force like IBM, endorsed by formal standards bodies or, as is increasingly the case, demanded by users. New York bureau manager Parker Hodges addresses the latter in "User Power Grows," p. 61.

Tim Mead

Tim Mead, Editor-in-Chief

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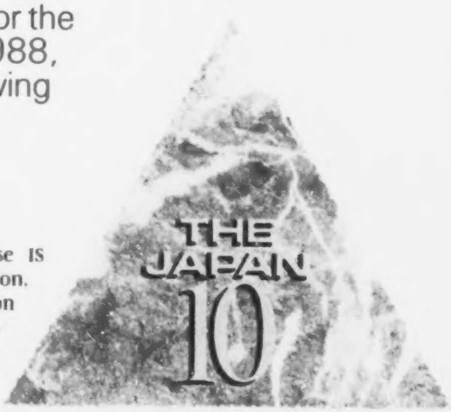
Japan's IS Market Momentum

Whether you figure it in dollars or in yen, growth for the top ten IS companies in Japan was stunning in 1988, evidence of the fact that Japan is the fastest growing major IS market in the world.

BY STUART M. DAMBROT



The combined IS revenues of the top 10 companies in Japan soared by a massive 29% last year in dollar terms to $44 billion. That was up from $34 billion in 1987.

Even taking into account the 11% rise in the value of the yen during the course of 1988, that still leaves a formidable 18% growth rate—making Japan by far the fastest growing major IS market in the industrialized world.

This continuing IS momentum in the island nation helped the Asia/Pacific region as a whole to increase its share of the world IS market from 22% in 1987 to 25% last year. That's compared with a drop of 3% in market share for North America, an area that now accounts for only 38% of world IS revenues and is likely to fall even further over the next few years.

The threshold for entry to the DATAMATION Japan top 10 ranking also rose significantly—up by 22% from Oki Electric Industry Co. Ltd.'s $921.2 million in 1987 to Ricoh Co. Ltd.'s $1.12 billion this year.

Once again, at the top of the IS heap in 1988 was Fujitsu Ltd., the supercomputer-to-PC company that saw local IS sales rise by a healthy 28% in dollars. Fujitsu's Japanese sales topped $9 billion last year, and the Japanese market now accounts for 83% of its total IS revenues.

Just behind Fujitsu is NEC Corp. which reported Japanese IS revenues up 17% to $8.9 billion. NEC is closing the gap fast on Fujitsu. In 1987, the two Japanese giants were separated by over $400 million, but last year NEC chopped that gap down to only $227 million.

IBM Japan Ltd. follows NEC at number three, up one place from last year because of more reliable 1987 figures and improved revenue performance stemming from strong sales of its AS/400 midrange computers. It seems that the U.S. company's new partnership policy in Japan, where the company has linked up with a variety of local hardware and software firms, is paying off.

Hitachi Ltd. has been pushed back to the number four slot in the 1988 survey, but, with less than $200 million separating it from IBM at number three, this is certainly ground it can recover if it has a strong year in 1989.

Hitachi was the only company to drop a place on the 1988 ranking, with four companies moving up one place—IBM to number three, Oki to number nine, Nippon Telegraph & Telephone Co. to number eight, and Nihon Unisys Ltd. up to number seven. Nihon Unisys (formerly Nippon Univac Kaisha Ltd.) recorded the top growth rate of the ten companies due to the merger of the Burroughs and Sperry operations in Japan. The company had revenues of over $2 billion in 1988, representing a massive 59% increase in dollar terms.

Off the list for 1988 was Mitsubishi Electric Corp., which ranked number seven in the 1987 table. This fall was due to two factors—more reliable breakdowns of the company's IS business and only modest growth in its IS revenues over the year. Mitsubishi's departure opened the way for fast-growing Ricoh to enter the list at number 10, up from number 11 in 1987. Ricoh's 37% boost in IS sales pushed its Japanese IS revenues over the $1 billion mark for the first time in 1988.

But while sales rose throughout the Japanese islands, the high yen, rising costs at home and growing fears of protectionism in foreign markets forced Japan's IS industry offshore in 1988.

Some Japanese firms even began to move their research and development activities offshore, especially to those Asian countries where they've already estab-

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JAPAN: Growth for the top 10 IS companies in Japan was stunning in 1988. ______ 64-1

EUROPE: Through Istel '92, IS managers from 20 phone companies hope to create a one-stop telecom shop. ______ 64-1

INNOVATIONS: Meiko offers new Sun-based workstations; Memorex brings out an intelligent workstation. ______ 64-2

Leading Japanese-Owned Computer Companies

Nippon Telegraph and Telephone entered the list in 1988, displacing Mitsubishi.

RANK	COMPANY	1988 TOTAL IS REV ($MIL)	% CHG ($U.S.)	%CHG (YEN)
1	Fujitsu	10,999.1	25.9	11.5
2	NEC	10,475.7	27.3	12.8
3	Hitachi	8,247.6	31.5	16.5
4	Toshiba	4,226.6	22.8	8.8
5	Matsushita	3,441.0	30.9	16.0
6	Canon	3,391.6	43.1	26.8
7	Nihon Unisys	2,057.7	58.9	40.8
8	Ricoh	1,727.5	35.4	20.0
9	Nippon Tel & Tel	1,694.0	50.1	33.0
10	Seiko Epson	1,487.7	24.1	10.0

Source: DATAMATION.

lished a manufacturing and sales presence: Hong Kong, Singapore, South Korea and Taiwan—the so-called "Four Dragons." At the same time, manufacturers are turning to Indonesia, Malaysia and Thailand for manufacturing because of cheap labor and other cost advantages.

Office Computers Unique to Japan

The main IS product developments in Japan in 1988 and early 1989 were the office computer, or OFCOM, a configuration unique to the Japanese market, and the release of supercomputers which, notes John Stern, vice president of Asian operations at the American Electronics Association's (AEA) Tokyo office, "have whittled down the American supercomputer competition down to Cray."

Lower down the power scale, the mainframe continues to be popular despite its slowdown in other markets. "To me," observes Dave Moschella, senior vice president at International Data Corp., a consulting firm based in Framingham, Mass., "the most striking thing about Japan's domestic market—especially when compared with the U.S.—is that it continues to be so mainframe-intensive. The installed base of mainframes in Japan equals that in the U.S., even though the total number of machines is half of that in the States. They're reportedly trying to change and use more PCs and minis, but the numbers don't show that yet. Smaller machines are being used in small businesses, but large corporations are still fairly centralized—even though PC technology from the U.S. should be driving them the other way."

The obstacles to widespread PC use seem to remain the same: the difficulty of handling the complex Japanese language on a keyboard (which few Japanese have used); the delays involved in processing Japanese characters on anything less than a 32-bit microprocessor (which, according to NEC, is incorporated in only 5% of the computers now used in Japan); the lack of standardization in Japan's computer industry; and historical differences in software development (spreadsheets, for example, have not really caught on).

Strategies for the 1990s

In the 1990s, the Japanese feel, the number of on-line global information systems with as many as 100,000 terminals will steadily increase. To meet the anticipated demands of these large-scale strategic systems, all Japanese mainframe manufacturers announced a wide spectrum of products in 1988, with special emphasis on a number of factors. These include: microcomputer/mainframe linkage (MML); the ability to handle large volumes of data with widely varying formats, including batch-processing for management coupled with distributed processing for business; hardware and operating system software capable of multimedia transmission, in preparation for full-scale implementation of the integrated services digital network (ISDN); and the ability to support multivendor systems and networks.

The Japanese mainframe computer market's product cycles are IBM-driven. In 1988, IBM began shipping its AS/400 midrange computers. Partly in anticipation and partly in response to this announcement, IBM's main competitors here—primarily Fujitsu, along with NEC, Hitachi, Toshiba and Nihon Unisys—started delivering comparable systems. These companies typically compete on a cost basis, giving large discounts to government and academia. This tactic effectively excludes U.S. firms from these markets, and generates an intense do-

The DATAMATION Japan 10

The combined revenues of the top 10 IS companies in the Japanese market reached $44 billion in 1988.

1988 RANK	1987 RANK	COMPANY	OWNERSHIP	1988 JAPAN IS REV ($ MIL)	% CHG ($ US)	% CHG (YEN)	1988 WORLDWIDE IS REV ($ MIL)	% CHG ($US)	1988 WORLDWIDE REV ($ MIL)
1	1	Fujitsu	Japan	$9,162.3	27.8	13.3	$10,999.1	25.9	$16,905.5
2	2	NEC	Japan	8,935.3	32.4	17.3	10,475.7	27.3	22,895.1
3	4	IBM Japan	US/Japan	6,543.2	27.3	12.8	9,269.2	26.4	9,269.2
4	3	Hitachi	Japan	6,367.1	23.8	9.7	8,247.6	31.5	46,885.1
5	5	Toshiba	Japan	3,558.8	32.6	17.5	4,226.6	22.8	28,759.0
6	6	Matsushita	Japan	2,938.6	33.1	17.9	3,441.0	30.9	40,721.9
7	8	Nihon Unisys	Japan/US	2,057.7	58.9	40.8	2,057.7	58.9	2,057.7
8	9	Nippon Tel & Tel	Japan	1,694.0	50.1	33.0	1,694.0	50.1	42,920.3
9	10	Oki	Japan	1,192.4	29.4	14.7	1,472.1	29.4	4,311.8
10	11	Ricoh	Japan	1,116.0	36.7	21.1	1,727.5	35.4	5,370.1

Source: DATAMATION.

mestic price war. Recently, IBM was forced to adopt the same tactic, offering discounts of up to 70%. The move is creating a backlash, with Japanese firms halving prices in response.

To compete against IBM's 3090 mainframes, Fujitsu last year introduced the Amdahl 5990-1400 and 5990-700 machines in Japan—its first fully IBM software-compatible mainframes. In software, Hitachi announced Hitachi Application Architecture (HAA)—similar to IBM's Systems Application Architecture (SAA)—which will allow Hitachi systems of all sizes to use the same software. Hitachi also introduced its M-620, M-630 and M-640 compact, high-performance low-to-midrange general-purpose computers, offering these small-business computers also an alternative to IBM's AS/400.

The current debate over UNIX standardization has found its way to Japan, where on May 18 this year, the major players—the OSF (Open Software Foundation), UII (UNIX International Inc.) and Japan's IPA (Industrial Technology Promotion Agency) which backs the Japanese UNIX-based SIGMA software productivity project, joined the international standards group X/Open Co. Ltd.

Interoperability also emerged as a major trend in 1988. According to INTAP (Data Processing Interoperability Technology Association), there have been successful connectivity experiments of equipment with standardized file transfer and data management functions. Japanese manufacturers are planning to gradually commercialize and sell such equipment later this year, after INTAP completes successful trials using Open Systems Interconnection (OSI) protocols.

JAPAN IS REV AS % OF TOT REV	IS REV AS % OF TOT REV	NET INCOME ($ MIL)	1988 TOTAL EMPLS	FISCAL YEAR END
83.3	65.1	456.5	94,825	Mar.
85.3	45.8	573.8	105,486	Mar.
70.6	100.0	665.1	21,061	Dec.
77.2	17.6	1,060.3	161,000	Mar.
84.2	14.7	600.5	129,000	Mar.
85.4	8.4	1,471.0	134,186	Mar.
100.0	100.0	27.5	7,616	Mar.
100.0	3.9	1,322.3	279,983	Mar.
81.0	34.1	106.4	18,659	Mar.
64.6	32.2	121.2	33,000	Mar.

Fastest Growers in Japan

The merger of Burroughs and Sperry operations in Japan brought Nihon Unisys to the top of the growth chart in 1988.

JAPAN 10 RANK	COMPANY	% CHG (YEN)	JAPAN 1988 IS REV ($MIL)
7	Nihon Unisys	40.8	$2,057.7
8	Nippon Tel & Tel	33.0	1,694.0
10	Ricoh	21.1	1,116.0
6	Matsushita	17.9	2,938.6
5	Toshiba	17.5	3,558.8

Source: DATAMATION.

Currently, the engineering workstation (EWS) market is dominated by U.S. firms, and for the last four years the vast majority of EWSs in Japan have been stand-alone units. However, the market for network configurations has been rapidly expanding. Fujitsu, Hitachi, Mitsubishi Electric, Toshiba and other manufacturers are all participating.

The NeXT Coup

"Japan's chips and peripherals—especially laser printers and floppy disks—create opportunities for themselves," says IDC's Moschella. "But the U.S. is keeping them at bay." Perhaps the biggest U.S. coup was pulled off by Palo Alto, Calif.-based NeXT Inc. when it managed to get Canon Inc. to pay a whopping $100 million for a mere distributorship for the innovative NeXT workstation. Moschella says he is "amazed that Canon paid that amount of money without getting any technology rights. There must be something else going on—perhaps long-term joint development work."

Also creating opportunities are new developments in laptops. Starting to appear in Japan are thin, ultralight full-function laptops. The first is the NEC Ultralight, a 4.4-pound model for the U.S. market. Seiko Epson Corp. has announced one even smaller. Soon to arrive (some have already been displayed at trade shows) are laptops with color liquid crystal display (LCD) screens from Hitachi, NEC, Seiko Epson, Sharp Corp. and Toshiba. As might be expected, color costs a lot: the units are expected to sell for $10,000 abroad and ¥1 million in Japan.

Looking toward the future, the AEA's Stern also points to a renewed interest in TRON (The Realtime Operating System Nucleus), a private sector project initiated by Ken Sakamura in 1984 dedicated to developing open systems architecture. Although the TRON projects—MTRON (Macro), ITRON (Industrial), BTRON (Business) and CTRON (Central and Communication)—are in various stages of development Sakamura already envisions a ¥100 billion TRON-based Intelligent City, built by the year 2000.

Future Visions

But perhaps the most important long-range concern among the information service industry is Japan's growing internationalization particularly in terms of software and services imports. For example, 75% of the data bases used in Japan originate overseas. When the supercomputer wars fizzle out over the next few years, data bases may be the new trade battleground. In the meantime, Japan's domestic market looks set to continue its rapid growth during 1989, providing an even stronger base from which its domestic IS giants can expand into markets in Europe and the United States. But, although these high growth rates may last through this year, Japanese companies must prepare to hit a domestic ceiling sooner or later—possibly in the early to mid-1990s. That's when the world will find out which companies are the real IS samurai and which companies are just along for the ride. ▭

Stuart M. Dambrot is a freelance journalist in Tokyo.

Where the Smart IS Investors Are Putting Their Money

Customers of information systems are determined to connect systems before shopping for new CPUs.

BY MADELINE FRANCHI

Large U.S. users of information systems are focusing on connecting their existing computer systems rather than buying new ones. That much is evident in the latest purchasing data from the U.S. government, which show communications investments climbing at a much higher rate than computer outlays. In the first quarter of this year, U.S. businesses spent at an annualized $46.9 billion rate for communications equipment. In that same quarter, businesses were spending at an $39.1 billion annualized clip for computers and office equipment. Compared with a year ago, communications purchases picked up 10%, but computer investments edged up a mere 1.2%.

Spurring communications purchases is the battle waging among long-distance carriers and local telephone companies for a share of the voice and data transmission revenues generated by both corporate and residential customers.

In contrast, the spending pace for computers and office equipment has indeed slowed—although it is still above last year's levels. In the second quarter of 1988, business expenditures for computer systems had swelled to an annualized $41.0 billion—18.2% above the spending rate exhibited in the second quarter of 1987. Since mid-1988, though, the growth rate has shrunk to 1.2%.

The causes of this reticence to buy new computers are twofold: doubt and technology. Buyers are uncertain about the economy—in the United States and elsewhere. Fluctuating interest rates and world currencies, rampant mergers and acquisitions, and unstable political conditions continue to undermine the best economic forecasting models.

Buyers of computer and office equipment also are in the dark about the existence of technical standards—be it operating systems, bus architectures or communications protocols. Data suggest buyers will continue to hold off on purchases of major new systems until they see some real standards emerge.

Technology itself continues to advance rapidly enough to lower the price of computer performance—albeit at a slower rate than in years past. That means customers can increase their computer investments marginally and still realize significant increases in raw computing power.

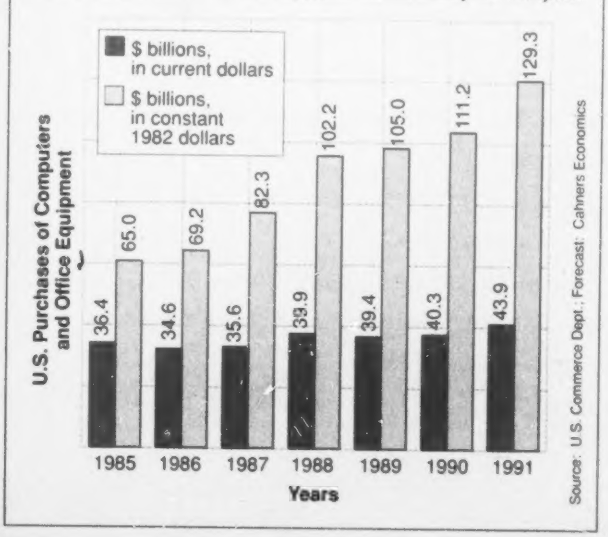
Such expectations, combined with the doubts about technology and the uncertain business climate, will lead to a 1% decline (in current dollars) for U.S. business purchases of computers and office equipment by the end of this year, Cahners Economics forecasts. But, this contraction will be mild and short compared with the 1985 – 1986 industry recession. And, business spending for computers is expected to turn around in 1990 and grow strongly through 1991.

At the same time, U.S. communications investments are expected to remain relatively strong throughout the economic slowdown of the next year or so. Purchases of networks, multiplexers, central-office switches and the like may increase as much as 8% this year. The pace will slow to 5% in 1990 but quicken again in 1991.

More economic information can be obtained from Cahners Economics Department, 275 Washington St., Newton, MA 02158, (617)-964-3030.

Holding the Line on Computers...

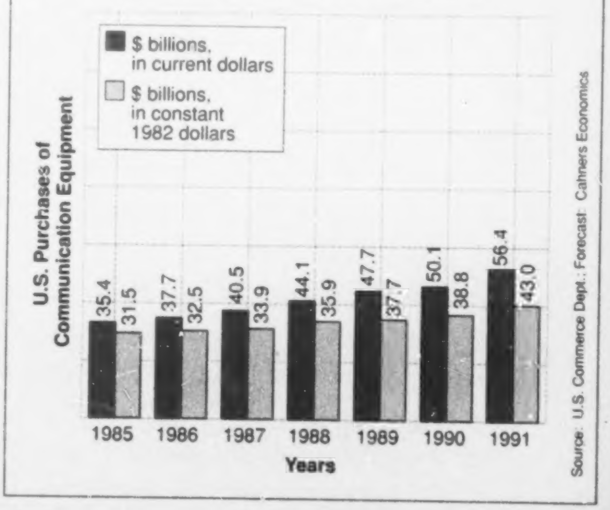
U.S. business investments in systems will be nearly flat this year.



Source: U.S. Commerce Dept.; Forecast: Cahners Economics

While Letting Loose on Communications

Corporations are not letting uncertain economies stop them from buying communications equipment.



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DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

WHAT ARE YOU WORTH?

Our 1989 Salary Survey Reveals
Why Network Skills Are Golden,
While Programming Pays Pennies

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UNITED S

The Grooming of IS
File Services: A Network
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The Client-Server Pers

OCT. 1, 1989

VOLUME 35
NUMBER 19

DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

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DATAMATION's annual salary survey indicates that IS pros will receive an average pay increase of 5.6% this year. But certain jobs are paying more. Data management and telecommunications skills, for example, are commanding raises as high as 28%. And security directors are pulling in an astounding 37% more than they did last year.

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BY J.J. BloomBecker Assessing what other IS managers are doing to safeguard computer systems is probably the best source of ideas on how to shut down computer crime, which now costs the average installation in the United States more than $100,000 a year.

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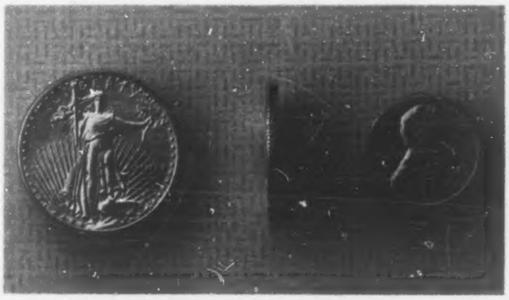
INSIDE DATAMATION

Critical Resource Management

No skill is more important to IS managers than the ability to supervise people. Advances in information technology don't mean a thing unless users of new systems and software recruit or train individuals to apply such tools to their enterprises.

The right people don't come cheap, however. Hotshot business analysts, network managers and database administrators—just a few positions in the emerging fields of IS craftsmanship—can name their price. It's a price that some users are apparently willing to pay, judging from this year's IS salary survey, the subject of "What Are You Worth?," p. 22. It's also one that has forced IS executives overseeing payrolls to make tough choices about where to find the resources to pay today's IS hotshots.

"I went through 10 years of salary survey results," says senior writer Ralph Emmett Carlyle, who crafted this issue's cover story. "At no time is it more apparent than today that the top guys who run these IS shops are making trade-offs on who gets paid what." The organizational changes, he writes, that create new jobs are part of a general shift toward networking—a transition that is now reflected in new salary and compensation structures that reward telecommunications and data management skills and deemphasize older disciplines such as operating system programming.


Photograph by Dave Bradley

WHAT SIDE of the coin are you on? Are your IS skills worth their weight in gold or pennies?

Carlyle's analysis of this year's data—generated by our research team of Nancy Gaygan, Brandt Brito and Liza Rebetz—also suggests that IS managers and professionals under their charge should take a fresh look at how they use the article's information. IS teams should examine the data with a self-critical eye.

Reaching for Excellence

Several IS teams already exhibit the capacity to expand their reach beyond the realms of yesteryear. For example:

- The members of the IS organization assembled at Motorola Inc.'s Government Electronics Group have significantly reshaped their computer-aided software engineering (CASE) strategy, which used to depend on IBM mainframe technology. It now rests on networked UNIX workstations for the most part, as senior writer Jeff Moad details in "A CASE of the Mainframe Blues," p. 37.
- Stereo component maker Bose Corp. in Framingham, Mass., is developing its own in-house set of IS skills to migrate from a host style of computing to a client-server model. Such daring can be found at other companies trying to process information cooperatively, too, as Boston bureau manager Chris Sivula finds in "The Client-Server Perspective," p. 47.
- Ed Fessler, IS manager for Weyerhaeuser Co.'s sales and marketing operations, heads up an aggressive program to recruit college talent to serve as interns in his Tacoma, Wash., division. "I'm surprised at how . . . productive these young people are," Fessler tells contributor David Stamps in "The Grooming of IS Interns," p. 67.

What is so surprising is how adept IS executives like those at Motorola, Bose, Weyerhaeuser and several of the companies evaluated in our salary survey are at managing their best IS resource—people. If these executives are the rule, not the exception, it bodes well for the profession.

Tim Mead

Tim Mead, Editor-in-Chief

DATAMATION

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What Are You Worth?

DATAMATION's annual salary survey indicates that IS pros will receive an average pay increase of 5.6% this year. But certain jobs are paying more, as much as 37%.

BY RALPH EMMETT CARLYLE

The IS gravy train is still rolling along, despite dire warnings of economic slumps and a rapidly maturing industry. Top computer professionals polled in DATAMATION's annual salary survey predict that the mean earnings of their staffs will climb an average 5.6% this year, a repeat of 1988, higher than the current projected annual inflation rate of 5%.

At the same time, IS executives polled in the DATAMATION survey are predicting that employee turnover will decline from last year's 8% to an average of 7.4%. Some experts take this as an indication that the industry is maturing and consolidating. But so many new IS job categories are being created by corporations that this seems unlikely. In addition to the three new positions that join the survey this year—network engineer, network administrator and microcomputer/workstation manager (a computer operations function)—there are many other new job categories that could be added in the years ahead.

Take, for example, supervisor of trade systems (or supervisor of electronic data interchange, as it is also known), a new job created at Bearings Inc. of Cleveland, which pays in the $40,000 range. Or director of artificial intelligence, a new American Express Co. position, which is in the $60,000+ range. "The industry is changing too fast to become mature. It's still a baby," says Barbara Gibbs, a senior consultant at Edward Perlin Associates Inc. of New York City, a consulting firm that tracks IS salaries. It predicts a 6.8% average increase in IS salaries this year for very large companies.

It's clear from this year's survey that the organizational changes creating the new jobs are part of a general shift from stand-alone systems toward networking, a transition that is now reflected in new salary and compensation structures that reward telecommunications and data management skills and deemphasize older disciplines such as operating system (OS) programming. Managers of and specialists in networking and databases will receive raises ranging from 16% to over 27%.

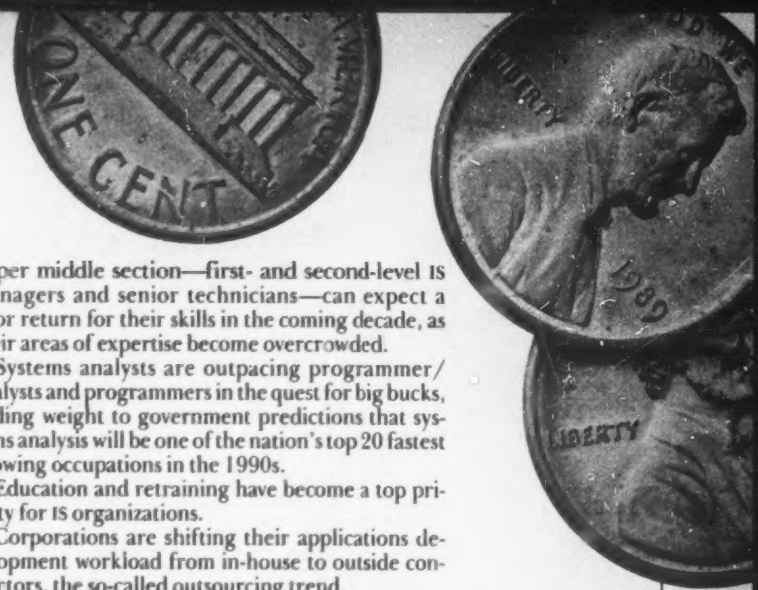
Corporations are also more security minded. As this year's most rewarded IS position, directors of security should enjoy an astounding leap of 37% in salary from $40,876 to an average of $55,875. Yet last year, salaries for this position suffered an average 9% drop in pay, making it one of 1988's biggest losers. Part of the reason for the dramatic increase in average salary is that many companies have had no prior director of security and so are uncertain what to pay. "Some are not convinced that they need such a manager," says Bearings' vice president of IS, Bryan Sanders. "They use consultants to design a security system and then maintain it as part of their existing computer architecture," he explains.

Who's Up/Who's Down

Salary Survey results show the coasts attract the biggest paychecks, while the Midwest is left dry.

Vice President, Corporate IS	
I'll Take Manhattan	$124,375
Philadelphia Freedom	112,500
Capital in Washington	87,500
1989 average:	**77,014**
Don't Leave Your Check in San Francisco	76,857
Not Mile High in Denver	40,000
The St. Louis Blues	31,000

At the opposite end of the spectrum are the OS programming managers and technicians, the forgotten people of this year's poll. Salaries across this group will suffer an average 21% cut. OS programming is also a virtual no-growth category at professional services companies, finds a recent survey for the Computer Software and Services Industry Association (aka ADAPSO) conducted by New York City-based research firm William M. Mercer-Meidinger Hansen Inc. (The DATAMATION salary survey covers only those IS professionals working within corporations and not those working for outside IS professional service companies.) The salaries of lead OS programmers in the outside contractor firms will grow only 1.5% this year, Mercer predicts. Average salaries for entry level OS programmers at these firms are expected to drop 22% to $23,700. "Their



Who Cashed In

Managers of and specialists in networking and databases will receive raises ranging from 16% to over 27%, but security directors enjoyed the largest hike.

% Increase From 1988	
Director of Security	**37.6%**
Communications Analyst	27.2%
Database Manager	25.8%
Communications Manager	18.1%

Steepest Slide in 1989

Operating systems managers and programmers will suffer an average 22% cut.

% Decrease From 1988	
Junior Systems Programmer	35.6%
Senior Systems Programmer	19.9%
Intermediate Systems Programmer	19.7%
Operating Systems Manager	12.5%

skill is simply not in demand," says Joyce Cain, manager of Mercer's National Survey Group. Mercer is predicting an average 5.8% increase in salaries for professionals in the computer services industry as a whole this year.

Manufacturing, Transportation Up

A rejuvenation of the nation's manufacturing sector is also revealed by the DATAMATION survey. Consumer manufacturing, in particular, is now roaring back with hefty pay increases for IS workers in virtually all categories, but especially for those with networking know-how. The task of tying together the various systems serving the shop floor, inventory control and management functions is growing ever more complex, hence the need for people with interoperability skills.

Another big boomer this year is the transportation/utility sector. And even that least automated of industries, construction, is stirring, proving to be a competitive payer in such categories as systems analysis and data management, although not yet in telecommunications. The financial services sector (apart from banking) continues to be a sluggish performer and has not yet worked the October 1987 Wall Street crash out of its system. Experts think it will improve in 1990, however. The medical and legal industries sector has proved to be an erratic performer in past surveys, punishing its IS pros one year and rewarding them the next. This year it is expected to turn on them once more. Other major findings from the survey:

- Demand far exceeds supply at both the top and the entry level of the IS career ladder. Those in the upper middle section—first- and second-level IS managers and senior technicians—can expect a poor return for their skills in the coming decade, as their areas of expertise become overcrowded.
- Systems analysts are outpacing programmer/analysts and programmers in the quest for big bucks, adding weight to government predictions that systems analysis will be one of the nation's top 20 fastest growing occupations in the 1990s.
- Education and retraining have become a top priority for IS organizations.
- Corporations are shifting their applications development workload from in-house to outside contractors, the so-called outsourcing trend.

What could be termed a two-tier salary and compensation structure seems to be the new order at IS shops. Top IS executives are suddenly in short supply and so is entry level talent. Perlin Associates reckons that computer science graduates from the Class of '89 who are now entering the work force will average $26,700 per job, an increase of 10% over last year's starting salary. The DATAMATION survey shows that other (noncomputer science) college graduates now taking entry level positions at IS organizations should command a salary in the $25,000 range, whether as junior applications programmers or junior systems analyst/programmers, up 9% from last year.

Competition for entry level talent has grown fierce, as both vendors and IS organizations compete for a diminishing number of candidates.

Senior IS executives are benefiting from being a scarce commodity at present. "Those earning more than $100,000 a year are being offered 25% pay hikes to decamp to other companies right now," says John J. Davis, principal at John J. Davis & Associates Inc., a New York City consulting firm that searches for high-priced IS talent for its corporate clients. Average salary increases at the vice president of IS level will be in the 12% range this year, according to both the DATAMATION and Perlin surveys.

"While everybody is looking for top VP [of IS] ex-

Old-Line Industries Storm the Ladder

The least automated sectors are starting to require networking, systems analysis and data management.

Consumer Manufacturing	
Corporate Vice President	$114,000
Communications Manager	66,000
Transportation/Utility	
Corporate Vice President	107,500
Communications Manager	61,000

Education, Government Learn the Hard Way

These traditionally underappreciated sectors remain low on the payscale.

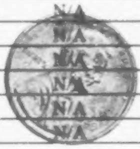
Education	
Corporate Vice President	$38,000
Communications Manager	40,000
Government	
Corporate Vice President	61,400
Communications Manager	40,250

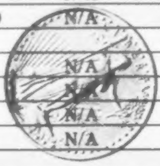
Source: DATAMATION Salary Survey

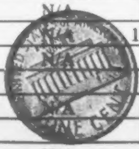
Average Salary by Region (in $)

	ALL		% CHG			NYC		WASH/	
	1988	1989	+/−	BOSTON	MANHAT	AREA	PHILA	BALT	ATLANTA
CORPORATE STAFF									
■ Vice President	67,643	77,014	13.9	70,000	124,375	90,000	112,500	87,500	75,000
■ Director of DP/MIS	54,189	56,204	3.7	50,286	116,333	65,464	69,333	68,125	56,000
■ Technical Services Manager	56,859	56,395	−0.1	35,000	102,500	79,000	59,333	57,500	57,000
■ Information Center/Data Center Manager	42,203	45,417	7.6	39,000	87,500	53,400	53,140	52,000	44,000
■ Director of Security	40,876	55,875	36.7	N/A	65,000	66,500	70,000	59,500	N/A
SYSTEMS ANALYSIS									
■ Manager	45,561	50,666	11.2	43,500	63,333	57,500	58,000	54,500	40,000
■ Senior Systems Analyst	41,518	44,299	6.7	35,730	50,000	47,833	51,000	48,333	35,000
■ Lead Systems Analyst	37,067	41,118	10.9	37,399	N/A	44,250	39,900	52,500	N/A
■ Systems Analyst	33,446	35,403	5.9	32,333	45,000	36,333	37,467	41,000	N/A
■ Junior Systems Analyst	27,599	30,316	9.8	27,000	N/A	30,250	34,000	42,000	N/A
APPLICATIONS PROGRAMMING									
■ Manager	45,581	49,164	7.9	41,625	N/A	42,400	54,000	56,625	35,000
■ Lead Application Programmer	38,269	41,764	9.1	39,575	50,000	39,857	43,333	49,400	25,000
■ Senior Application Programmer	36,397	36,669	0.7	39,000	N/A	39,800	32,000	45,000	20,500
■ Application Programmer	28,493	30,856	8.3	34,909	N/A	33,000	33,425	40,833	18,000
■ Intermediate Application Programmer	26,127	28,562	9.3	35,000	N/A	32,333	38,000	36,500	N/A
■ Junior Application Programmer	22,947	24,257	5.6	30,000	N/A	27,500	27,075	30,000	N/A
SYSTEMS ANALYSIS/PROGRAMMING									
■ Manager	51,316	50,547	−1.5	48,500	76,000	54,750	46,500	55,000	43,750
■ Lead Systems Analyst/Programmer	42,430	42,552	0.3	42,333	52,333	47,620	44,000	50,000	36,000
■ Senior Systems Analyst/Programmer	38,974	38,070	−2.3	38,000	40,000	44,458	38,833	45,000	38,333
■ Systems Analyst/Programmer	30,926	33,062	6.9	33,450	36,500	39,000	45,000	36,667	33,000
■ Intermediate Systems Analyst/Programmer	28,079	30,733	9.5	32,000	37,000	29,250	42,000	42,500	30,000
■ Junior Systems Analyst/Programmer	23,620	25,871	9.5	25,500	30,000	25,600	40,000	33,333	25,000
OPERATING SYSTEMS PROGRAMMING									
■ Manager	57,351	50,156	−12.5	47,667	N/A	60,600	59,000	62,500	45,000
■ Senior Systems Programmer	57,846	46,315	−19.9	40,000	59,000	56,000	43,500	56,750	45,000
■ Intermediate Systems Programmer	47,940	38,488	−19.7	33,500	40,300	45,000	37,500	45,333	40,000
■ Junior Systems Programmer	47,462	30,547	−35.6	29,000	N/A	32,000	40,000	34,567	25,000
DATABASE ADMINISTRATION									
■ Manager	41,649	52,409	25.8	N/A	78,000	N/A	57,500	52,500	50,000
■ Database Administrator	36,579	42,307	15.7	N/A	N/A	30,000	48,500	50,000	40,000
DATACOM/TELECOM/CONNECTIVITY									
■ Manager	46,605	54,350	18.1	55,000	75,000	66,500	66,500	56,250	44,000
■ Analyst	33,998	43,242	27.2	41,500	58,500	35,000	51,000	56,500	40,000
■ Network Engineer	N/A	41,211	N/A	N/A	39,000	40,000	45,000	53,250	38,000
■ Network Administrator	N/A	33,175	N/A	N/A	29,000	32,000	40,000	43,333	30,000
COMPUTER OPERATIONS									
■ Manager	37,072	36,578	−1.3	40,000	54,000	48,200	47,000	41,714	39,333
■ Shift Supervisor	30,827	32,074	4.0	27,859	31,000	35,250	38,500	40,333	33,500
■ Lead Computer Operator	24,464	25,544	4.4	28,500	27,000	29,143	29,100	40,000	26,500
■ Computer Operator	21,346	20,716	−3.0	21,400	22,000	22,500	29,500	29,750	21,500
■ Microcomputer/Workstation Manager	N/A	30,053	N/A	18,000	N/A	21,000	28,500	55,000	N/A
PRODUCTION AND I/O CONTROL									
■ Supervisor	29,016	32,988	13.7	32,000	N/A	34,333	39,000	35,000	N/A
■ Lead Production Controller	26,433	31,269	18.3	N/A	N/A	25,000	37,000	38,000	N/A
■ Scheduler	24,493	25,130	2.6	24,000	N/A	20,000	N/A	27,500	N/A
■ Control Clerk	21,127	20,330	−3.8	14,000	20,000	20,000	29,700	30,000	N/A
DATA ENTRY									
■ Supervisor	22,898	24,005	4.8	21,000	N/A	27,833	21,333	45,500	25,667
■ Operator	16,838	17,431	3.5	17,580	18,500	17,854	16,750	22,500	18,000
OFFICE AUTOMATION									
■ Word-Processing Supervisor	23,822	29,980	25.9	20,000	N/A	36,500	35,000	36,500	N/A
■ Word-Processing Operator	17,930	19,347	7.9	15,000	N/A	23,500	24,000	26,500	N/A
■ Microcomputer User Services Specialist	25,054	27,783	10.9	27,500	N/A	24,333	29,000	35,900	18,000
OTHER									
■ Specialists	24,828	28,916	16.5	40,000	38,000	45,000	41,000	35,000	N/A
■ Consultant	48,810	49,433	1.3	80,000	N/A	55,500	45,000	45,000	N/A
■ PC Evaluator	32,127	33,438	4.1	23,000	N/A	35,000	50,000	35,000	N/A

CHI	MINN/ ST. PL	CLEVE	CINN	DTRT	ST. LOU	HOUS-TON	DENVER	DALLAS	SEATL	SAN FRAN	LOS ANGEL
62,097	68,500	N/A	N/A	N/A	31,000	60,000	40,000	71,333	60,000	76,857	53,000
55,750	54,000	41,002	42,000	43,000	42,000	75,200	56,667	54,857	35,000	48,700	63,722
52,500	45,000	N/A	49,000	39,000	N/A	N/A	N/A	54,000	N/A	62,000	77,500
54,167	45,200	N/A	34,500	50,000	45,000	28,000	36,000	48,833	N/A	67,500	50,916
35,000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	42,000	N/A	N/A	N/A
51,388	43,000	66,000	32,500	52,000	45,000	65,000	N/A	34,000	40,000	67,000	71,667
66,500	38,000	44,018	N/A	47,000	N/A	41,333	[illegible]	34,400	N/A	45,520	46,857
35,167	37,667	N/A	N/A	47,000	N/A	N/A	[illegible]	41,000	N/A	46,000	53,244
39,450	31,000	28,500	25,000	35,000	N/A	35,000	N/A	38,000	25,000	42,000	38,500
30,000	N/A	N/A	27,000	N/A	N/A	N/A	[illegible]	17,000	N/A	N/A	35,000
55,000	55,000	N/A	45,000	52,000	43,000	70,000	32,500	N/A	N/A	71,667	90,000
37,500	N/A	N/A	36,000	52,000	37,500	53,000	32,500	40,000	28,000	50,250	75,000
36,333	35,500	25,000	30,000	50,000	N/A	30,850	30,000	38,500	N/A	43,000	44,333
38,000	26,667	N/A	24,000	42,000	32,000	26,400	24,000	28,500	24,000	35,500	42,500
27,500	17,000	N/A	20,500	N/A	N/A	23,000	N/A	N/A	N/A	N/A	35,000
26,667	23,000	N/A	18,000	35,000	27,500	20,100	N/A	21,000	N/A	26,000	23,000
45,833	49,500	N/A	31,000	41,000	N/A	56,000	44,000	47,333	N/A	65,000	70,500
37,500	N/A	N/A	N/A	41,000	N/A	42,000	36,850	36,200	N/A	38,116	59,000
38,667	33,000	N/A	30,000	31,000	N/A	37,100	N/A	36,500	32,400	41,200	60,000
33,929	29,500	N/A	27,333	26,000	N/A	37,250	N/A	31,667	N/A	31,000	42,500
28,000	N/A	N/A	N/A	N/A	N/A	29,700	25,750	28,000	N/A	N/A	45,000
22,000	N/A	N/A	N/A	N/A	N/A	25,800	21,200	22,000	N/A	N/A	35,000
46,000	32,000	N/A	35,000	N/A	N/A	N/A	33,500	47,000	N/A	75,000	68,500
37,900	N/A	N/A	N/A	57,000	N/A	43,600	29,250	39,333	N/A	56,500	62,500
39,250	N/A	15,600	27,500	N/A	N/A	39,400	N/A	37,667	N/A	N/A	55,000
N/A	N/A	N/A	N/A	N/A	N/A	35,300	20,000	28,000	N/A	N/A	50,000
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	70,000	95,000
45,000	34,000	N/A	N/A	N/A	N/A	46,850	N/A	37,000	17,500	44,333	65,500
25,000	36,667	N/A	N/A	N/A	N/A	N/A	N/A	67,500	35,000	64,750	90,000
35,300	37,000	34,000	N/A	N/A	N/A	N/A	N/A	28,500	N/A	52,500	75,000
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	35,000	N/A	49,500	60,000
N/A	24,00	N/A	N/A	N/A	N/A	N/A	N/A	32,500	N/A	41,500	50,000
41,400	35,750	31,000	30,000	N/A	N/A	39,400	28,000	32,500	41,000	44,700	45,125
32,725	26,000	N/A	N/A	N/A	N/A	38,000	N/A	28,333	N/A	30,250	38,900
23,167	24,400	N/A	25,750	N/A	25,000	19,400	22,000	26,189	20,000	32,902	28,333
21,129	17,850	14,950	20,000	18,000	18,550	20,033	17,267	19,667	29,833	25,667	20,512
N/A	N/A	N/A	N/A	N/A	N/A	N/A	28,000	22,000	N/A	N/A	35,000
N/A	30,000	N/A	34,400	N/A	N/A	N/A	N/A	41,000	22,000	40,000	34,000
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	27,500	N/A	N/A	40,000
N/A	28,000	27,000	N/A	N/A	N/A	N/A	N/A	26,000	N/A	N/A	35,000
20,000	N/A	18,000	N/A	N/A	N/A	22,000	N/A	N/A	17,000	N/A	25,000
20,000	24,734	10,000	17,000	28,000	23,000	N/A	N/A	33,000	18,000	22,000	23,471
18,425	16,510	16,240	17,800	18,000	16,000	N/A	13,000	20,467	20,000	23,400	16,700
N/A	N/A	N/A	N/A	N/A	N/A	N/A	26,500	30,500	N/A	32,000	30,000
18,400	15,000	N/A	18,500	N/A	N/A	N/A	18,000	20,000	18,000	21,250	22,000
N/A	24,333	N/A	N/A	N/A	N/A	N/A	23,500	22,000	N/A	28,000	30,000
N/A	28,000	N/A	N/A	N/A	N/A	N/A	25,000	19,000	N/A	22,000	45,000
65,000	10,000	[illegible]	N/A	N/A	N/A	N/A	10,000	41,000	N/A	45,000	60,000
N/A	N/A	N/A	N/A	N/A	N/A	N/A	25,000	37,000	N/A	40,000	60,000

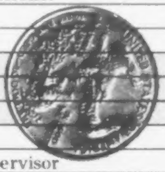






Average Salary by Industry (in $)

	1988	1989	% CHG +/−	CONSUM MFG	INDUS MFG	BANK	FINAN	EDP SERV	DISTRIB
CORPORATE STAFF									
■ Vice President	67,643	77,014	13.9	114,000	88,000	77,207	69,833	68,750	66,667
■ Director of DP/MIS	54,189	56,204	3.7	60,976	54,222	91,600	54,167	67,500	55,500
■ Technical Services Manager	56,859	56,395	-0.1	65,429	56,500	75,667	52,667	67,500	55,000
■ Information Center/Data Center Manager	42,203	45,417	7.6	55,764	42,390	78,333	48,283	47,000	40,583
■ Director of Security	40,876	55,875	36.7	66,667	N/A	61,500	42,000	N/A	N/A
SYSTEMS ANALYSIS									
■ Manager	**45,561**	**50,666**	**11.2**	**52,429**	**48,682**	**59,450**	**51,000**	**44,000**	**51,667**
■ Senior Systems Analyst	**41,518**	**44,299**	**6.7**	**44,833**	**42,463**	**54,214**	**40,250**	**44,674**	**41,667**
■ Lead Systems Analyst	**37,067**	**41,118**	**10.9**	**45,000**	**40,797**	**48,000**	**41,233**	**42,882**	**40,000**
■ Systems Analyst	**33,446**	**35,403**	**5.9**	**42,200**	**29,636**	**37,000**	**34,480**	**42,044**	**36,500**
■ Junior Systems Analyst	**27,599**	**30,316**	**9.8**	**31,000**	**31,750**	**35,000**	**24,000**	**28,000**	**N/A**
APPLICATIONS PROGRAMMING									
■ Manager	45,581	49,164	7.9	52,263	53,000	41,500	55,000	43,826	N/A
■ Lead Application Programmer	38,269	41,764	9.1	39,000	45,889	48,000	41,000	43,218	35,000
■ Senior Application Programmer	36,397	36,669	0.7	33,000	33,429	45,000	40,667	43,258	34,667
■ Application Programmer	28,493	30,856	8.3	34,429	30,038	38,000	29,740	29,965	26,067
■ Intermediate Application Programmer	26,127	28,562	9.3	23,986	31,000	34,000	17,000	30,383	30,000
■ Junior Application Programmer	22,947	24,257	5.6	25,333	24,556	22,500	24,750	23,175	24,000
SYSTEMS ANALYSIS/PROGRAMMING									
■ Manager	**51,316**	**50,547**	**-1.5**	**46,571**	**50,050**	**52,083**	**53,000**	**52,714**	**40,000**
■ Lead Systems Analyst/Programmer	**42,430**	**42,552**	**0.3**	**38,225**	**48,167**	**45,700**	**35,500**	**47,900**	**41,750**
■ Senior Systems Analyst/Programmer	**38,974**	**38,070**	**-2.3**	**32,660**	**36,333**	**40,000**	**34,250**	**37,594**	**36,467**
■ Systems Analyst/Programmer	**30,926**	**33,062**	**6.9**	**31,050**	**31,500**	**33,400**	**31,250**	**31,333**	**34,000**
■ Intermediate Systems Analyst/Programmer	**28,079**	**30,733**	**9.5**	**24,917**	**30,000**	**30,750**	**24,767**	**30,000**	**28,000**
■ Junior Systems Analyst/Programmer	**23,620**	**25,871**	**9.5**	**22,050**	**26,500**	**25,667**	**21,667**	**18,000**	**25,000**
OPERATING SYSTEMS PROGRAMMING									
■ Manager	57,351	50,156	-12.5	52,000	49,188	51,750	49,000	60,000	41,500
■ Senior Systems Programmer	57,846	46,315	-19.9	46,607	42,462	54,667	38,000	N/A	46,500
■ Intermediate Systems Programmer	47,940	38,488	-19.7	38,000	32,456	45,100	36,333	N/A	38,000
■ Junior Systems Programmer	47,462	30,547	-35.6	24,333	26,500	25,350	29,000	24,000	32,000
DATABASE ADMINISTRATION									
■ Manager	**41,649**	**52,409**	**25.8**	**52,333**	**56,400**	**55,000**	**57,500**	**N/A**	**78,000**
■ Database Administrator	**36,579**	**42,307**	**15.7**	**44,667**	**42,625**	**29,000**	**N/A**	**35,000**	**17,500**
DATACOM/TELECOM/CONNECTIVITY									
■ Manager	46,005	54,350	18.1	66,000	61,667	47,667	46,500	N/A	N/A
■ Analyst	33,998	43,242	27.2	37,333	28,575	39,125	31,500	N/A	N/A
■ Network Engineer	N/A	41,211	N/A	54,000	40,000	37,250	28,500	N/A	N/A
■ Network Administrator	N/A	33,175	N/A	32,667	32,500	24,750	25,500	N/A	N/A
COMPUTER OPERATIONS									
■ Manager	**37,072**	**36,578**	**-1.3**	**39,136**	**37,733**	**35,278**	**25,529**	**42,000**	**39,171**
■ Shift Supervisor	**30,827**	**32,074**	**4.0**	**31,429**	**35,100**	**28,100**	**26,200**	**N/A**	**28,250**
■ Lead Computer Operator	**24,464**	**25,544**	**4.4**	**22,719**	**25,714**	**21,750**	**22,117**	**20,000**	**26,750**
■ Computer Operator	**21,346**	**20,716**	**-3.0**	**20,231**	**20,223**	**18,789**	**17,527**	**22,667**	**22,982**
■ Microcomputer/Workstation Manager	**N/A**	**30,053**	**N/A**	**22,000**	**30,000**	**28,000**	**N/A**	**28,000**	**N/A**
PRODUCTION AND I/O CONTROL									
■ Supervisor	29,016	32,988	13.7	40,000	40,000	27,750	33,000	N/A	23,000
■ Lead Production Controller	26,433	31,269	18.3	33,333	26,000	24,667	29,000	N/A	N/A
■ Scheduler	24,493	25,130	2.6	24,000	31,000	20,833	26,666	N/A	N/A
■ Control Clerk	21,127	20,330	-3.8	22,667	24,000	18,333	12,500	N/A	N/A
DATA ENTRY									
■ Supervisor	**22,898**	**24,005**	**4.8**	**22,000**	**22,412**	**21,167**	**24,000**	**19,650**	**18,500**
■ Operator	**16,838**	**17,431**	**3.5**	**17,618**	**18,795**	**13,900**	**14,420**	**16,600**	**17,067**
OFFICE AUTOMATION									
■ Word-Processing Supervisor	23,822	29,980	25.9	29,750	24,000	30,667	39,000	30,000	N/A
■ Word-Processing Operator	17,930	19,347	7.9	14,500	20,550	18,750	15,400	20,000	19,000
■ Microcomputer User Services Specialist	25,054	27,783	10.9	22,000	36,500	26,500	22,000	22,000	32,500
OTHER									
■ Specialists	**24,828**	**28,916**	**16.5**	**22,500**	**23,000**	**33,833**	**23,500**	**35,000**	**N/A**
■ Consultant	**48,810**	**49,433**	**1.3**	**35,000**	**45,000**	**80,000**	**N/A**	**79,500**	**10,000**
■ PC Evaluator	**32,127**	**33,438**	**4.1**	**32,333**	**N/A**	**27,500**	**26,000**	**N/A**	**N/A**



GOVT	MED/ LEGAL	TRANS/ UTIL	EDUCA	CONSTR/ MIN/AGRI	ANNUAL SPENDING < $1 MIL	> $1 MIL
61,400	85,000	107,500	38,000	60,000	60,357	92,953
47,404	51,600	72,833	42,950	57,500	46,672	70,932
41,483	47,500	60,000	30,000	55,000	47,133	59,482
40,183	34,625	54,000	30,200	34,333	38,536	54,343
46,833	N/A	85,000	N/A	43,000	39,000	59,769
46,000	55,000	54,333	41,325	58,333	43,884	55,976
41,252	40,000	56,000	26,667	46,000	41,126	46,581
39,040	N/A	45,000	26,000	N/A	36,592	44,750
37,000	30,000	37,400	33,500	N/A	32,393	37,773
28,667	N/A	31,000	N/A	N/A	30,750	30,214
50,333	45,000	50,500	20,000	N/A	42,100	55,911
42,222	N/A	44,833	27,000	43,000	38,302	45,300
37,778	32,667	N/A	25,000	32,000	32,183	41,444
32,686	28,333	31,825	18,000	27,333	26,574	34,665
27,250	25,000	34,000	25,[illegible]	N/A	24,002	30,516
25,248	20,000	29,750	15,033	20,000	22,369	25,905
49,429	40,000	55,500	50,500	55,000	44,797	55,028
40,493	35,000	50,400	18,000	38,750	38,398	45,990
39,333	35,000	45,800	36,800	37,000	35,131	40,056
35,829	31,250	37,486	28,167	36,500	30,239	35,103
32,500	N/A	34,750	N/A	28,500	26,554	32,987
26,533	20,000	29,600	N/A	24,500	22,756	22,996
43,800	37,250	58,250	40,000	N/A	38,364	54,480
46,750	35,500	52,667	30,000	46,000	38,400	48,795
34,250	N/A	43,600	N/A	40,000	26,888	42,318
38,000	25,000	40,000	N/A	N/A	24,283	33,892
48,500	30,000	52,500	30,000	N/A	42,750	54,556
40,661	N/A	44,000	35,000	45,500	30,786	44,703
40,250	N/A	61,000	40,000	43,000	32,500	58,720
57,400	N/A	45,500	N/A	39,000	32,300	45,729
57,500	N/A	41,500	21,500	28,500	41,500	41,156
39,951	N/A	31,667	N/A	N/A	29,750	33,518
31,933	31,000	53,333	30,714	45,500	30,437	43,482
32,127	N/A	39,000	N/A	38,000	28,186	33,841
28,346	26,667	26,795	26,500	26,000	23,044	28,523
22,019	19,857	28,920	18,800	22,000	19,066	22,781
33,467	N/A	41,000	N/A	N/A	N/A	31,331
30,667	30,000	41,000	33,000	N/A	28,000	33,441
38,000	N/A	42,000	N/A	28,500	26,000	31,708
24,900	20,000	N/A	N/A	N/A	27,000	24,996
21,543	N/A	23,150	15,000	22,000	20,933	20,139
35,875	N/A	31,250	24,617	17,000	20,929	27,604
18,110	18,500	19,250	19,256	17,180	16,513	20,056
32,667	32,000	35,000	25,000	N/A	26,750	31,500
20,750	21,750	24,000	21,000	14,533	18,449	20,638
28,362	25,000	37,000	22,000	30,000	22,955	30,312
31,825	N/A	41,000	26,000	24,000	23,039	30,463
45,750	N/A	45,000	27,800	N/A	47,817	52,667
35,000	N/A	50,000	28,500	N/A	32,333	33,692

ecutive talent and bright youngsters at the entry level, there's less demand for what's in the middle," says Dave Flansbaum, a veteran recruiter of IS professionals. Adds Flansbaum, who is managing director for the northern California region at nationwide IS recruiter Source EDP in San Francisco, "The middle is being squeezed."

Flansbaum calls the people suffering this indignity the "historians" of the profession. They are the members of the baby boom generation, men and women in their 30s and early 40s that manage, modify and maintain existing mainframe- and minicomputer-based systems. Their careers flourished in the 1970s when their companies were getting the first of these machines. But over the years, they have become identified with these now-aging code museums and not with the businesses that employ them. That has diminished their marketability outside their companies.

They are the growing residue that didn't make it to the top of the IS career ladder. Over the years, they have settled into first- and second-level management positions or became senior technicians.

A Psychological Barrier

Over the past decade of DATAMATION surveys, the salary of IS vice presidents has doubled. The historians have also prospered, with gains in the 60 to 70% range, depending on specialty. But, over the past three surveys, it's been a different story. Salaries of IS VPs have climbed 20%, and entry level salaries have risen 25% over the period. But managers of such areas as applications programming and systems analysis—even directors of DP/MIS—have only scored 11 to 12% gains over that same period.

The new hot position of manager telecom/datacom realized a 16.4% salary increase over the same three-year period. And even the manager of database administration made more than his peers in programming and systems analysis on this year's survey. Senior and lead technicians in the historian group face an additional challenge, especially in small or midsized companies. "There's a psychological barrier," says Flansbaum. "These smaller concerns are reluctant to pay $50,000 and up to anyone that doesn't have the title 'manager.' "

These historians, especially those with an OS programming or analyst/programmer speciality, whether managers or technicians, are the big losers—the only losers—in an otherwise very positive salary survey. Factor them out, and the overall average salary increase would climb to around 8%.

Systems Analysts in Demand

One group doing well is systems analysts. "That's because the career path we're emphasizing is systems analyst to business analyst," says Marilyn Smith, second vice president and section information officer for the retail information services unit of The John Hancock Mutual Life Insurance Co., based in Boston. Smith says that programmers working in COBOL and other third-generation languages will still be around for a long time, but the move to fourth-generation languages (4GLs) and computer-

Methodology

On June 7, 1989, 3,000 questionnaires were mailed to a random sample of DATAMATION subscribers. The sample selected was made up of the top IS individual (or "key man per site") in each of 2,010 general sites and 990 *Fortune* 1,000 companies. The sample selection was on an "nth-name" basis from a list of those that qualified. That is, names were selected at a specified interval throughout the list (say, every fifth name, or every ninth name), so that a systematic random sample of the entire list resulted. To achieve the highest possible response rate, each outgoing envelope was personally addressed to the recipient, and a $1 bill and prepaid envelope were included to facilitate return of the completed questionnaire. By July 7, 344 completed questionnaires had been returned, for a response rate of 11.5%. The results were tabulated, and this report was based on the data from the 344 replies.

aided software engineering (CASE) tools is accelerating.

"We no longer have any jobs with [the word] *programmer* in the title," says Robert Berger, director of IS at Central Hudson Gas & Electric Corp. in Poughkeepsie, N.Y. He adds that 95% of all his programming is currently done in 4GLs and that the shift in the industry is to rules-based languages and 4GLs made more palatable to nontechnical programmers by an infusion of expert system or CASE technology into their structures.

The historians are not just the victims of a two-tier salary focus; they, and maybe the whole classical IS organization, are threatened by another emerging trend—outsourcing. IS executives compelled to deliver end solutions, not only at the right price but with more business know-how than they may have needed before, are turning to outsiders.

Five years ago, the average number of contract and part-time staff members on the payroll of the average company was 4.8 persons. This year, that number has grown to 14.1. Bear in mind that the average number of full-time employees per site will this year be around 50, less than it was five years ago, and you begin to get the picture.

As outsourcing accelerates, job turnover is declining at IS organizations, meaning, perhaps, that many of these IS workers will get stuck in humdrum jobs. To combat this, IS shops are turning with a vengeance to education and retraining. Last year, the average IS employee was given 107 hours of training at an estimated cost of $3,092. That's a big increase over the previous mark of 64 hours and $2,800.

This year's DATAMATION salary survey also reveals that perks remain an important method of boosting morale and improving the IS worker's lot. But there has been little change in the types of benefits offered over the years. Perhaps the biggest change over last year is an increase in stock options. These are now available in 23.5%, as opposed to 20%, of cases. Equity is often a lure to IS talent joining software companies or new technology ventures.

I'll Take Manhattan

Corporations will continue to offer exotic locations to the talent they most prize. But Source EDP's Flansbaum warns that regional differences in salaries aren't as sharp as they once were. "You should move to the San Francisco Bay area because you want to live there, not because the salaries seem higher. Factor in the cost of living, and you're no better off than if you were in Houston or Detroit," he says. A glance at salaries by region reveals that, as expected, Los Angeles and Manhattan are the big payers. The East Coast offers higher salaries to high-level corporate staffers. The West Coast is better for most other categories.

In any event, IS professionals in search of top salaries must always choose their industries with great care. Across the board, ISers in the field of education earn considerably less than average; those in transportation/utilities, manufacturing, electronic data processing services and financial services, considerably more.

The odds are, however, that in whichever industry or region IS workers find themselves this year, they'll be better paid than the typical U.S. worker. Nonagricultural workers employed by private industry in the United States earn less than $18,000 a year on average. Only one of the 49 job categories in the DATAMATION survey—data entry operator ($17,431)—reported a mean salary of less than $18,000. While it's true that IS workers are threatened by outsourcing and other perils, for this year, at least, they're still aboard the gravy train. ▭

IS Job Descriptions and Levels

Job Descriptions

The following is the job description guide used by respondents to the survey.

Corporate staff: reports to senior management within corporation.

Applications programming: develops, designs and prepares programs.

Systems analysis/programming: performs systems analysis and applications programming.

Operations systems programming: programs and maintains systems software.

Database administration: plans, organizes and schedules the activities of the database section; establishes standards, maintains dictionary.

Datacom/telecom: develops and designs datacom networks and the installation and operation of data lines.

Computer operations: in charge of equipment, data entry, production control and postprocessing, but not systems analysis, or other development functions.

Production and I/O control: sets up and schedules jobs for processing so as to maximize utilization and meet turnaround requirements.

Data entry: performs data entry and verification functions.

Office automation: operates word-processing equipment, intelligent typewriters and terminals for text editing/word processing.

Job Levels

Manager: Requires an advanced degree and a minimum of five years' experience or equivalent combinations. Performs personnel evaluations, budgeting, progress reporting and project management.

Lead: Requires a bachelor's degree or equivalent and a minimum four years' experience (two in supervisory capacity). Performs supervision as a project manager.

Senior: Requires a bachelor's degree or equivalent and a minimum three years' experience. Includes some supervisory functions.

Intermediate: Requires a bachelor's degree or equivalent and a minimum two years' experience. Requires some direction.

Junior: Requires two to four years' college and six months' experience. Needs direct supervision.

The New Unisys Approach

The $9.9 billion computer maker is trying to hang onto its existing customers and make new converts by giving them an environment that protects their systems investments.

BY RALPH EMMETT CARLYLE

A new five-year plan from Unisys Corp. has an original twist. The world's fifth-largest computer maker thinks the best way to hold onto its proprietary mainframe system customers is to give them more chances to leave its private domain.

Sound crazy? The plan's two architects don't think so. Nor do several existing Unisys customers regard it as outlandish, though many do express reservations about following the plan. What makes sense to both seller and buyer is the foundation on which the world's number five computer maker is trying to build its future—software.

Unisys is offering its customers very high-level software that will allow them to escape—in a sense—from the proprietary provinces of Burroughs Corp. and Sperry Corp., the two companies that merged to form Unisys in 1986 and whose mainframe architectures dominate the high end of its product line. The escape route even may lead users to machines made by Unisys' nemesis, IBM.

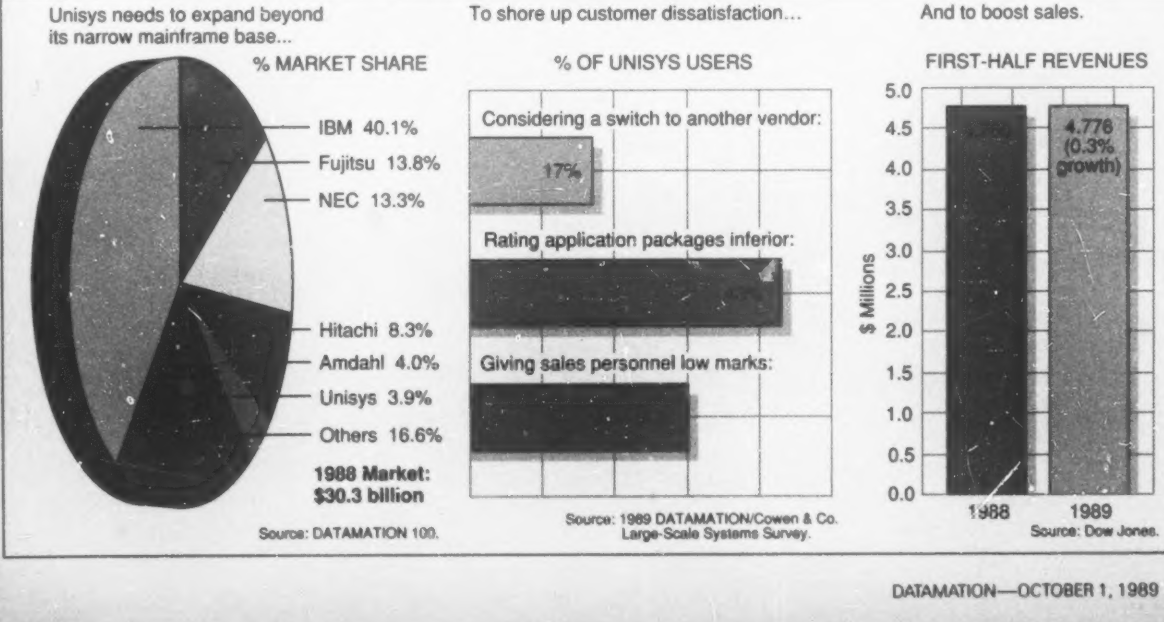
Visions of a New World

"We intend to offer our customers the opportunity to look through one of our 4GLs [fourth-generation languages] and say, 'Bang! It's there. That's the IBM world,' " says Jim Murtaugh, vice president of engineering at Unisys. He and coarchitect David Dreschel, vice president of mainframe program management, believe Big Blue has even helped their construction efforts by consolidating IBM software development around one plan—Systems Application Architecture (SAA).

Make no mistake: Unisys does not want to sell IBM equipment. What it does want, however, is to help create a world in which all systems integrators and software creators write to the same set of machine independent interfaces. To help usher in that new day of computing, Unisys has:

- Become a driving force in the open systems movement and its favorite operat-

Why the Environmental Approach?



Source: DATAMATION 100.

Source: 1989 DATAMATION/Cowen & Co. Large-Scale Systems Survey.

Source: Dow Jones.

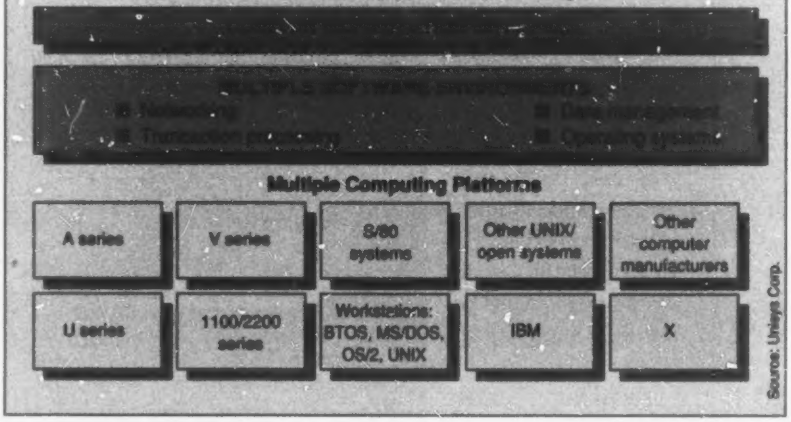
ing system, UNIX.

- Supported the Portable Operating Systems Interface (POSIX) standard, which doesn't just insist on UNIX but allows proprietary operating systems to proliferate behind its open interface.
- Developed its own high-level software platform that it refers to internally as the Solutions Generation Environment (SGE), an all-encompassing term for the 4GL and computer-aided software engineering (CASE) products that the company has developed through the years.

SGE represents an attempt to create synergies beyond what any of Unisys' three computer architectures—Sperry, Burroughs and UNIX—can do on their own. Customers reveal that the software productivity tool LINC, originally a product of the Burroughs environment, has just begun to ship to Sperry test sites for evaluation on their systems. By the end of the year, LINC will be offered to UNIX customers, too. MAPPER, the equally popular Sperry-based 4GL, has just been offered to Burroughs customers and already runs on UNIX systems. IBM will be next.

Environmental Issues

Unisys' real intent in pushing the Solutions Generation Environment is to create a common interface for its customers, regardless of what or whose equipment they are using.



Source: Unisys Corp.

Not Just Another Environment

Unisys describes SGE and POSIX as key elements of a strategy in which users and the company both win without exposing themselves to risk. "It's our attempt to overcome the fear independent software vendors have; namely, that our installed base is too small," says Murtaugh. Unisys wants resellers to feel that they can choose a Unisys mainframe over IBM's if the systems to which they add value require such a computer. It's hard to engender such feelings, however, because Unisys' nearly 4% share of worldwide mainframe sales pales in comparison to IBM's 40% portion.

"All they [solution sellers] see is the risk," says Dreschel. The new Unisys is hoping to find a lot more companies like Ferranti International Controls Corp. of Sugar Land, Texas. This value-added reseller (VAR) is now repackaging Unisys 1100 and 2200 model mainframes for resale to the utilities industry with its own database and applications.

In the past, Unisys wasn't very good at dealing with VARs, says George Wolf, a support group manager at Ferranti. But he gives company executives credit for trying to improve relations. "They try to accentuate the positive. And their high-level software orientation is very positive," he says.

☐ **UNISYS CORP. WANTS INTEGRATORS TO OVERCOME THEIR FEARS OF SELLING ITS MAINFRAMES.**

Some customers seem intrigued by what they're seeing these days from Unisys, though others continue to express dissatisfaction with the company. One in six Unisys customers, in fact, has been considering a jump to another vendor, according to last spring's large-scale systems survey by DATAMATION and Cowen & Co. A source of their discontent is the very thing Unisys is attempting to remedy—a lack of applications software.

"Many times it seems as though the rest of the world speaks one language and we speak another," says Dennis Blondell, assistant director of operations at Floral Network of Chicago, referring to the dearth of industry-specific software applications for his company's Unisys systems. "We've had to try and protect ourselves and free ourselves a bit," he adds. Though a MAPPER customer and aware of SGE, Blondell's division (part of the world's largest floral order and distribution center, Florists' Transworld Deliveries of Southfield, Mich.) intends to write its core mission critical programs in the C language, which is growing in popularity among software developers because of its portability features.

Customer Skepticism

The National Trust Bank in Toronto, one of Canada's top five banks, is also planning to go the C route. "Our Unisys mainframes will become more like fileservers as we shift more of the future applications work load to UNIX workstations," says John Ambrose, senior vice president of information systems. He regards MAPPER as a computer resources hog, worrying aloud that adopting its SGE parent could even double or triple the size of his data center configurations.

Roy Graham, an IS manager across town from Ambrose at Ontario Blue Cross, agrees that SGE will be a hog of sorts, but says that the cost of mainframe computing is dropping 20% a year to offset such fears. He sees SGE as a chance to turn his programmers into business analysts and to draw more nontechnical workers into software creation.

Some customers are already wedded to LINC. For example, at Liberty Travel Service in Paramus, N.J., all the company's mission critical systems have been written in LINC's 4GL form. Some say that Liberty vice president of MIS Bob Dever has allowed his company to escape hardware enslavement only to become a prisoner of the new Unisys software. Perhaps that's why one of his most fervent hopes is that independent software vendors become as enamored of SGE as he is and write a ton of new applications in its languages.

While it's too early to tell whether SGE will be accepted by most customers, it's not hard to determine what the environmental emphasis signifies. Unisys wants to be viewed primarily as a software and solutions seller. Further, one that can plug and play in any combination of hardware and programs the customer should desire. ▭

1

Short-Circuiting Computer Crime

Assessing what other IS managers are doing to safeguard computer systems is probably the best source of ideas on how to shut down computer crime, a $500 million a year industry.

BY J.J. BLOOMBECKER

What can the computer professional do to minimize the likelihood of being victimized by the ever present threat of computer crime and then being held accountable by upper management or end users for the breach in the system defenses?

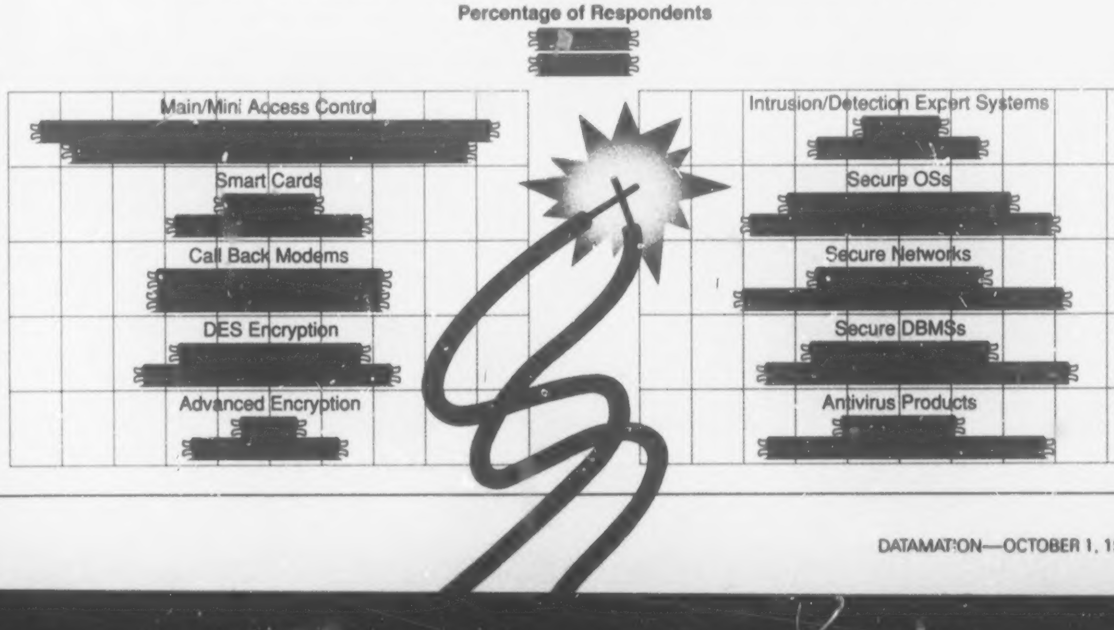
The extent of computer crime and the myriad of forms it takes preclude any single method guaranteeing protection. A recent survey of 3,500 computer security professionals by the National Center for Computer Crime Data (NCCCD) in Los Angeles estimates the annual losses from computer abuse, nationally, at $555,464,000. Of the survey respondents, the average installation experienced losses of $109,000, 365 person hours and 26 hours of computer time.

The survey also detailed nine types of computer crime—money theft, information theft, damage to software, malicious data alteration, deceptive data alteration, theft of services, harassment, extortion and damage to hardware. Telephone services were the most common service theft, with computer services constituting much of the remainder. Theft of services experienced the biggest jump in occurrence—24%—from the previous survey.

Nevertheless, there are as many avenues of thwarting computer crime as

Technology Safeguards Against Crime

In warding off computer crime, the use of mainframe/mini access control products is projected to drop by 1991, as demand for several other products, including smart cards and antivirus software, doubles.



Source: "Commitment to Security" (National Center for Computer Crime Data).

there are types of computer crimes. In determining which way to go, it is most helpful to consider some of the standards and practices in use among other computer professionals.

Donn Parker, a leading computer security consultant at SRI International in Menlo Park, Calif., studied the practices of a city, a county and a state data-processing service organization; a criminal justice research institute; a large insurance company; and two university data-processing centers. He devised a set of generally used controls that should be present in every well-run computer center (see table, "The Well-Secured Computer Center"). They were detailed in *Computer Security Techniques*, a 1982 publication of the U.S. Department of Justice Bureau of Criminal Justice Statistics.

Top Management Commitment

Though it was written seven years ago, Parker says the categories of baseline practices haven't changed, but 50 or 60 new practices have been added. These practices include the separation of duties, such as prohibiting application developers from administering the application; the "aging" of trash, where a firm holds onto its trash for 24 or 48 hours so nothing important is thrown out; and using daily code words for voice communications systems. One bank, which was aging its trash, was able to rescue $12 million worth of unprocessed checks that had been thrown out. Managers who choose not to implement these types of controls, Parker adds, will have to justify their action if challenged by upper management over a system failure.

The computer security professionals responding to NCCCD's survey, "Commitment to Security," ranked top management commitment to security the most important and valuable component of a general security strategy.

David Johnson, a lawyer with Washington D.C.-based Wilmer, Cutler & Pickering and author of a white paper on the legal issues involved with computer viruses, concurs with NCCCD's assessment. He recommends that corporations and other institutions consider security issues thoughtfully at their highest policy levels and adopt a set of preventive measures. These include enforceable policies for employee or student use and an emergency action plan that will minimize damage.

☐ **THE AVERAGE IS SHOP LOST $109,000, 365 PERSON HOURS AND 26 HOURS OF COMPUTER TIME.**

Security Guidelines

Other components of a security strategy, ranked in order of importance by NCCCD's survey respondents, are establishing corporate ethical norms for computer use, maintaining employee awareness and training, enforcing computer crime laws, securing communications and electromagnetic emanations and controlling physical access.

IS managers may find other complementary ideas for securing their systems in the security guidelines and standards developed by the National Institute for Science and Technology (NIST), formerly the National Bureau of Standards. These are among the Federal Information Processing Standards (FIPS), which the agency issues in all areas of computer use.

Steward Katzke, chief of the Computer Security Division at NIST, describes the FIPS as "good practices." "If neither they nor a comparable alternative are used," he adds, "it will be up to the user to explain why not."

Under the Computer Security Act of 1987, government users with "sensitive" information in their computers have no choice but to develop a computer security plan and to submit it to NIST. The express goal of the act is to ensure that agencies move toward more standardized government computer security practices. As of March 1989 NIST had received about 1,500 plans. Next, the agencies will have to implement the plans and train their personnel in computer security.

The NCCCD survey responses also show that security professionals are constantly changing the types of technologies they use to fend off any cracks in system security (see chart, "Technology Safeguards Against Crime"). Use of mainframe and minicomputer access controls, for example, rose to 85% in 1988 from 61% in 1985, but is expected to drop 10% by 1991.

In contrast, many other technologies and products, including smart cards, advanced encryption, intrusion detection expert systems, secure networks and antivirus products will be much more widely used in 1991 than in 1988.

Consequences of Inaction

Stan Stahl, the center's director of research, says: "The results of our survey demonstrate what others are doing to protect against various types of computer security violations. There is no escaping the need to keep abreast of other managers' practices, particularly those with similar vulnerabilities or in the same industry."

Attorney Johnson adds, "An institution that doesn't take the computer crime threat seriously and consider reasonable policies to reduce its risk will face a higher risk of litigation and be less well able to answer a claim that the institution had not acted responsibly to avoid the risk." ▭

The Well-Secured Computer Center

IS managers should consider adopting some or all of the seven types of general computer security controls:

- Manual assurance of data integrity—destroy discarded documents, eliminate incomplete and obsolete data.
- Physical security—keep a low profile for the computer center, prohibit smoking and eating in some computing areas.
- Operations security—isolate sensitive computer production duties, protect data used in system testing, set up disaster recovery policies, document courier trustworthiness and identification.
- Management-initiated controls—appoint a computer security management committee and officer, keep security reports confidential.
- Computer program development and maintenance controls—set up quality assurance procedures and access control for programming library.
- Computer system controls—set up technical review of operating system changes, cryptographic protection and input data validation.
- Computer terminal access controls—set up terminal identifiers and protocols for log-in.

Source: Computer Security Techniques (U.S. Department of Justice).

J.J. BloomBecker is an attorney and director of the National Center for Computer Crime Data, Los Angeles.

Industry Performance Update: Health Care and Financial Services

Both the financial services and health care industries hold potential for IS growth.

BY MADELINE FRANCHI

The catch phrase for the 1990s just might be, "Don't trust anyone under the age of 30." If so, it will be a result of the quiet revolution now occurring in population demographics. More than 80% of the projected increase in the population between 1986 and 2000 will take place among those aged 45 and older. With the aging population will come a significant increase in chronic afflictions and thus a greater need for health care services.

Last year alone, consumers spent $404 billion on medical care services, not including the billions spent annually on prescriptions and over-the-counter drugs. That spending rate represents an increase of just over 12% in one year. Cahners Economics expects similar increases in both 1989 and 1990.

Of course, a big chunk of that increase was the result of rising medical costs. Price increases for medical care services have been running over 6% in the last two years, and Cahners expects rises of over 7% this year and next.

In addition to the increased demand for health care and the rising cost of medical services, complicated Medicare/Medicaid accounting is contributing to rising expenses, making the IS department a critical component in the strategy to improve the quality and efficiency of our health care delivery system. According to the latest DATAMATION Budget Study (April 1, 1989, p. 18), the mean budget for these IS departments is expected to rise from $1.88 million last year to $1.98 million this year, an increase of 5.3%, as compared with an increase of 4.4% for IS budgets in general. The average number of employees in the IS department of health care organizations is estimated to increase from 28.3 in 1988 to 30.5 in 1989.

In some cases, budgetary squeezes or the shift toward distributed processing has reduced the size of the IS staff. However, over one-third of the health care companies surveyed noted that the development of mission critical applications and the recognition that information technology will play a crucial role in the company's future have motivated increases in staff sizes and budgets.

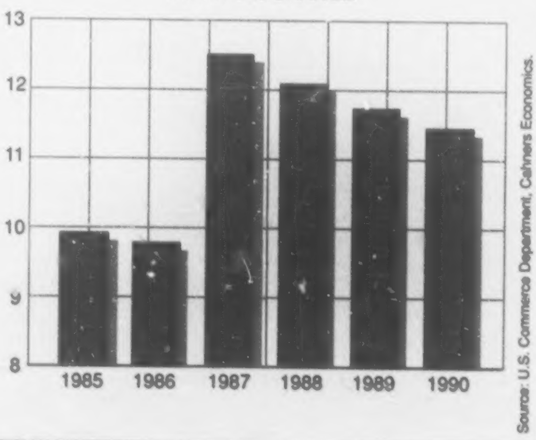
Automation and information technology are making significant contributions to the finance, banking and insurance industries. According to a U.S. Department of Labor report, output per employee in the commercial-banking area increased 30% from 1967 to 1985 (the last year for which statistics are available), with a 7% rise between 1983 and 1985 alone.

The latest technology drive is not just for automated teller machines, either. Market research firm Frost & Sullivan Inc. says that the greatest potential for branch banking automation systems appears to be for mortgage and commercial loan origination, product presentation and customer profitability analysis, with respective increases of 52%, 51%, 49% and 48% over the next five years. This is expected to occur as financial institutions begin relying on their branch operations to take on more of a marketing role.

From 1988 through 1992, Frost & Sullivan predicts the banking industry will invest $6.4 billion in teller station terminals, administration terminals, workstations and other IS equipment. Bank holding companies will be responsible for the largest single portion of those funds, laying out 49% of the dollars, followed by savings institutions, at 25%. ▭

Spending for Medical Care Services

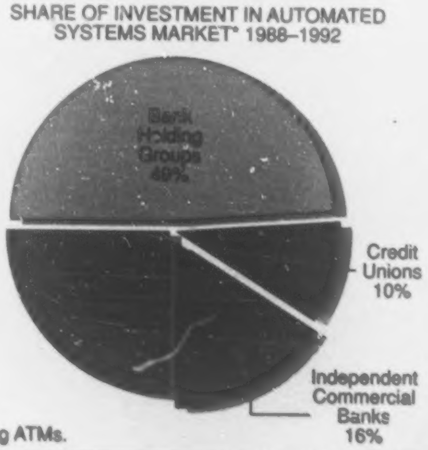
Sharp rises in heath care costs in
the past are fueling IS growth this year.



Source: U.S. Commerce Department, Cahners Economics.

Banks Holding the IS Advantage

Bank holding companies are investing
more than other financial institutions in automated
systems for their branches.



*excluding ATMs.

Source: Frost & Sullivan Inc.

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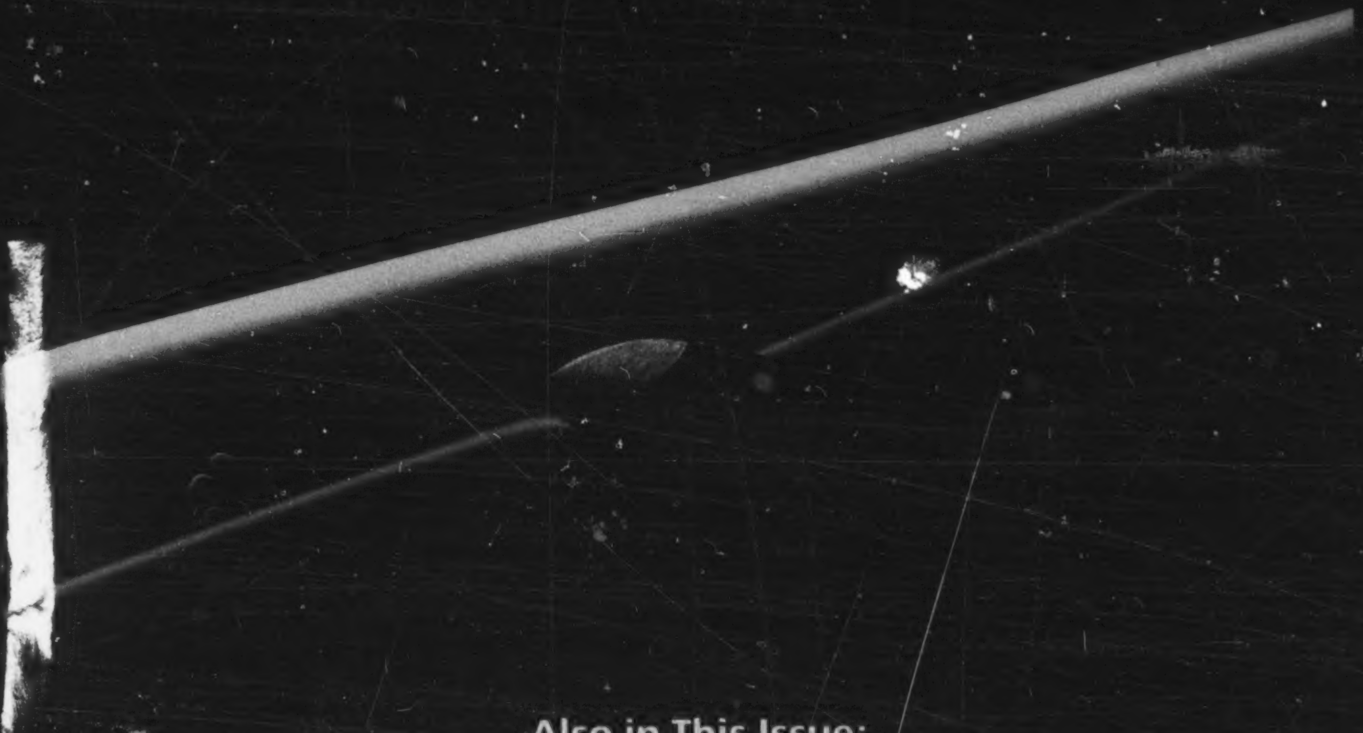
OCTOBER 15, 1989

Managing Your Vendor, Part I: Initiating Systems Projects

DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

CUTTING THROUGH NETWORK CONTROL



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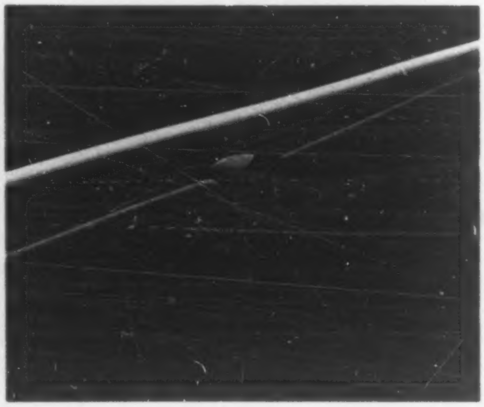

Cutting Through Network Control 30

BY SUSAN KERR Since the breakup of the Bell system, U.S. corporations have spent millions to put in private telecommunications networks. But now some of these firms are turning those networks over to outsiders. Company execs are looking for reduced costs and better use of their internal IS resources. Are they giving up control of a strategic part of their business?

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BY JANE MAJKIEWICZ Two years ago, when IBM brought out its Systems Application Architecture, it promised compliance tests to verify whether third-party software really conforms to SAA. In the absence of such IBM compliance tests, users have to rely on the tests of the software developers themselves.

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BY MARY JO FOLEY For high-volume paper pushers in IS, nothing but the fastest and largest will do. Many are opting for 51 + -page-per-minute nonimpact printers to handle large amounts of customized forms, direct mail and other IS-oriented applications.

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BY MARK W. DOLL AND WILLIAM J. DOLL When end-user applications overwhelmed its mainframe, hospital equipment maker American Sterilizer found an alternative to expensive upgrades through networked personal computers.

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BY LEILA DAVIS Unhappy with many off-the-shelf programs from vendors, some users in vertical industries are joining with vendors, consultants and even other users to develop their own, often broadly marketable, products.

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BY J.J. BLOOMBECKER Can you, the IS manager, be held liable for a system failure or a system security breach? A recent court case says that if a jury determines that a professional standard was neglected, you quite possibly can.

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Steering IS Committees Straight 89

BY ROBERT H. RECK AND VIRGINIA P. RECK The reason so many IS steering committees are inactive or indecisive can be traced to a single flaw: the failure of the IS director to properly identify which role the committee should play in the organization.

INSIDE DATAMATION

New Approaches to Winning IS Strategies

Competitiveness, as overused and abused as the subject might be, does stimulate people to examine old ways of doing business and to think about new ways of building capabilities important to an organization's future. Accordingly, most of the energy expended by IS managers today is directed toward improving their parent organization's standing with customers and against competitors. The result, in some very notable cases, is leading some companies to embrace radical approaches to managing IS resources.

Most radical, perhaps, is relinquishing all or part of a corporate telecommunications network to an outside service provider—the subject of Susan Kerr's cover story, "Cutting Through Network Control," p. 30. This path—down which such well-known U.S. companies as Ford Motor Co. and H.J. Heinz Co. have started—may strike most IS managers as a road to ruin. Many of them have fought long and hard to gain control of the networks that support their organizations and, therefore, are reluctant to give up the data highways now under IS jurisdiction.

KERR DISCOVERS the gains in giving away the nets.

SIVULA PROCESSES what's going on in factory systems.

Photographs by David Bradley

When you examine the motives of the car maker, the catsup producer and other companies like them, however, you begin to see that the decision to shift elements of wide area network management to outsiders isn't an issue of control at all. It's an issue of competitiveness. Ford, Heinz and friends realize that the world has changed since 1984 when AT&T's divestiture gave user organizations the impetus to seize network control. Thanks largely to advances in software, service providers can offer far richer network services at affordable prices. Users, too, face very different challenges than they did five years ago: in order to stay competitive, they must devote a greater amount of their IS human resources toward developing critical applications to run on today's local area networks and platforms.

As radical as the notion of ceding network control to outsiders may sound, the thought of codeveloping applications with suppliers that could then sell the fruit of such labors to competing user companies borders on heresy. Or does it?

In "A Test-Bed for IBM's Strategy," p. 67, Boston bureau manager Chris Sivula finds five major process manufacturers that have pooled their development resources with those of an independent software vendor and a hardware supplier. They are hoping to create applications that will easily integrate factory-floor data and business data to yield the type of analysis chief executives need to judge whether they are making and marketing products as efficiently as competition demands.

No free-world market has been subject to more competition than financial services, the soul of whose products often is information technology itself. That's probably why such financial giants as Aetna Life and Casualty are sharing enormous development responsibilities with key vendors. In the first part of our Managing Your Vendor series, contributor Leila Davis' story, "Initiating Systems Projects," p. 81, outlines why user organizations should look beyond in-house development capabilities toward partnerships with suppliers and consultants.

As much as IS managers should focus on competitiveness, they should not lose sight of other important issues. One is liability for faulty systems—the subject of lawyer J.J. BloomBecker's article, "Malpractice in IS?" on p. 85. It's required reading for all levels of IS management—particularly those individuals building competitive systems, alone or with outsiders, for their organizations.

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Tim Mead, Editor-in-Chief

DATAMATION

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The High-Volume Printer Option

A wide range of users are opting for 51 + -page-per-minute nonimpact printers to handle high volumes of customized forms, direct mail and other IS-oriented applications.

BY MARY JO FOLEY

With some technologies, nothing but the fastest and largest will do. Nonimpact printing is no exception.

For the time being, users are choosing the high-end 51 + -page-per-minute nonimpact models, whether they have laser, light-emitting diode or ion deposition print mechanisms. This is true despite the recent proliferation of slightly slower, yet far less expensive midrange (31-to-50ppm) page printers.

Most of the high-end zealots are buying the heavy duty printers to fulfill their typical monthly requirements of between 300,000 and 1 million copies, according to the Norwell, Mass., market research firm BIS CAP International Inc. A few other users, such as the service bureau PMC COM & Laser Services Inc. and TRW Inc.'s real estate division, are beginning to exploit the printers' ability to combine high-quality text and graphics.

Most of these users, predictably, fall into the $1 billion-plus annual corporate revenue category. But the fastest growing segment comprises users in the $100 million to $249 million range, according to the La Jolla, Calif.-based market research firm Computer Intelligence.

More is More

In addition, a growing number of users are small- to medium-sized mail houses and service bureaus, which specialize in producing customized forms and direct mail for other companies. Even though the highest end nonimpact printers carry an average price tag of $230,000 each—compared with the $64,000 average selling price for the newer 31-to-50ppm models—many customers believe that a single high-end printer is more effective in terms of price/performance than multiple midrange machines would be.

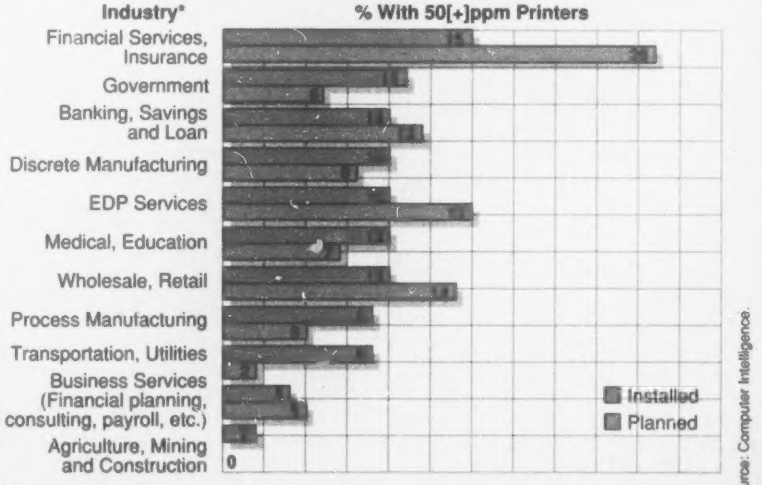
Consequently, while demand for the new generation of 31-to-50ppm printers is expected to climb a hefty 33.5% from 1989 to 1993, according to the San Jose, Calif.-based market research company Dataquest Inc., the bulk of the nonimpact printers sold this year will be in the 51 + ppm category. By 1993, however, U.S. nonimpact customers will buy 4,500 midrange nonimpact units, compared with 4,010 51 + ppm ones, Dataquest predicts.

Companies are tying the high-end printers into a wide variety of central processing units, ranging from desktop computers to mainframes. And, as BIS CAP industry analyst David Hudson points out, most users still rely on these printers to handle traditional DP-oriented applications, such as accounting dumps, forms and bill generation, internal reports and other large-volume batch functions.

The direct mail operation at Reader's

The Most Print-Intensive Industries

Financial services and insurance companies lead in high-end printer installations and planned installations.

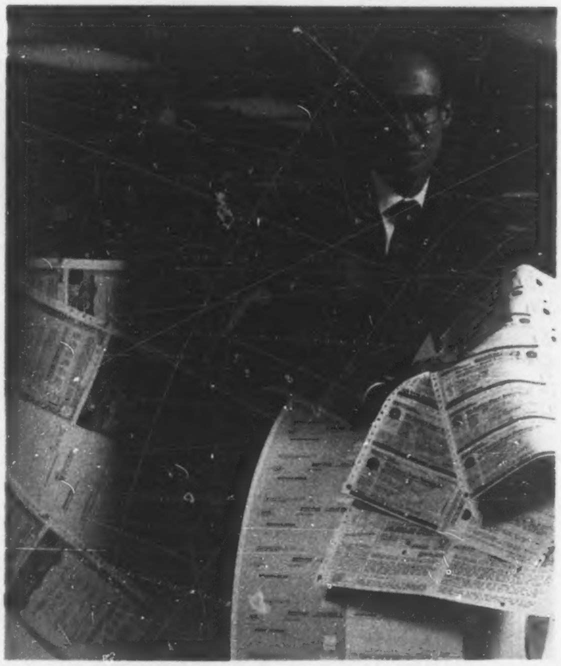


*Information based on a survey of 3,300 U.S. companies.

Source: Computer Intelligence

Digest Association Inc., for example, employs its high-end printer to generate some complex personalized correspondence. But it is the printer's horsepower, more than any other feature, that caused the firm to choose a high-end, and not a midrange, printer.

Reader's Digest carefully evaluated the possibility of using one or more of the new 31-to-50ppm page printers now on the market. It realized, however, that "we work in such high volumes that [midrange] printers alone aren't a realistic option," explains G. Thomas Pumo, associate director of DP technical services.



READER'S DIGEST'S PUMO: High volume direct mail requirements caused the company to choose a high-end printer.

In fact, the $1.4 billion Pleasantville, N.Y.-based company is one of the largest of the large-volume printer customers. Its IBM 3090 mainframe-resident database of prospects for its direct mail sweepstakes contains tens of millions of names. Pumo's division generates 300 million personalized direct mail letters each year to promote magazine subscriptions, book sales and other products.

Most of these direct mail pieces are generated in house by one of the company's five Siemens AG 2300 (103ppm) laser printers. A sixth 2300, also linked to the 3090, is used exclusively for data center testing and report generation.

Like Reader's Digest, Denny's Inc., the Irvine, Calif.-headquartered restaurant chain, opted for high-end machines because of the sheer volume of print requests it faced. The company originally relied on a single IBM 3800-3 high-end printer for all of its check- and report-printing needs. Three years ago, however, the information services division, fearing the havoc a system failure could wreak, decided to divide its in-house printing work among three high-end machines: a 70ppm Xerox Corp. 8700 and two 60ppm Storage Technology Corp. 6100s.

"We did reliability and price analyses, and Xerox and STC won," says Ronald Waters, manager of computing services. The company's priorities were speed and service, and it is satisfied with the printer choices it has made, he adds.

Smaller entrepreneurial start-ups are interested in high-quality text and graphics printing as a way to differentiate their products. The two-year-old Jacksonville, Fla.-based service bureau PMC COM, for one, already is the proud owner of three high-end Xerox printers: two 50ppm model 4050s and a newer 92ppm model 4090.

The bureau produces a wide variety of materials for its 45 printing customers, including year-end summary statements for financial companies, collection letters for hospitals, bar codes and labels for grocers, and order books and statements for wholesalers. PMC COM's customers provide it with tapes generated on various types of computers from which the bureau prints near-offset quality documents.

PMC evaluated all of the big name firms' offerings and chose Xerox, which had "the only piece of equipment with all the bells and whistles," claims company president Leila LeVan.

PMC also is looking to its Xerox machines to accommodate some jazzy new applications. The company is increasingly able to handle jobs previously done only by offset printers, such as consecutively numbered tickets and customized forms that can be generated on demand.

Another direct mail specialist that opted for a top of the line printer is the Colton, Calif.-based Real Estate Information Division of TRW. For the past year, the division has been migrating to a Kodak Ektaprint 1392. The printer is the heart of Kodak's Ektaprint Electronic Publishing System (KEEPS). "There were cheaper alternatives," acknowledges Rodger Cosgrove, manager of national accounts for the TRW division. "But we didn't want to be penny-wise in the short run but pound-foolish in the long run."

TRW Migrates to Kodak 1392

The TRW division uses the 1392 for two distinct applications: batch generation of statistical reports and production of direct mail pieces. Both applications are based on the same massive, proprietary database the company has built up over the years. The database consists of information gleaned from the 500,000 legal documents—deeds, trusts, grants and warranties documenting metropolitan real-estate transactions—that TRW data entry persons key into the division's 50 IBM-compatible 80286 and 80386 PCs. Images, such as digitized signatures, maps and diagrams, are input via a Kodak 1530 document scanner.

The company designs customized statistical abstracts, which average 500 pages each, and direct mail pieces for over 1,000 small-business owners. The printer's ability to combine high-quality text and graphics in a single document allows, for example, a local bank branch manager's digitized signature and a neighborhood map showing the location of the branch to be included in a letter soliciting new accounts. TRW calls this "advertising with intelligence."

Before purchasing KEEPS and its 1392 printer, TRW used a variety of desktop laser printers to generate a single master of a report or a piece of direct mail, then subcontracted out the high-speed copying. When evaluating replacement printers, the division rated nearly all of the available mid- and high-range printers by print quality, speed, cost per thousand pages to run, user interface, flexibility, reliability and installed base. The 1392 enables the division to produce the print quality nearest to offset, as well as save money and production time, says Cosgrove. ▭

Mary Jo Foley is a high-technology writer based in Cambridge, Mass.

Photograph by Judy Pazenico

A Test-Bed for IBM's Strategy

Five major process-manufacturers and a manufacturing software developer could help IBM execute its newest strategies to achieve a greater share of the industrial-computing marketplace.

BY CHRIS SIVULA

An IBM-based integrated environment for process manufacturers being promised by a couple of entrepreneurs in Virginia, called the Process Operations Management System (POMS), is likely to have an impact that reverberates well beyond the factory floor.

POMS may be a bellwether for IBM's various strategies aimed at positioning the company as an overall systems supplier for the 1990s. It is an early application of Systems Application Architecture (SAA) being developed by a third party and driven by some major IBM customers, but it is also designed to accommodate other vendors' equipment. As such, POMS embodies precisely the points of IBM's plans for the future that have yet to be fully tested.

In manufacturing specifically, IBM may be hoping to parlay any success it may have with POMS in process industries into areas of manufacturing. Traditionally, IBM has succeeded in process industries, while Digital has taken the lead in manufacturing with its plant floor systems.

Specifically to develop POMS, Curtis Grina, a computer scientist, and Paul Minor, a process engineer, launched Industrial Computing Designs Corp., or Incode, in Reston, Va., late last year. POMS is a software system designed to allow users to easily share information from the factory floor with the business side of process manufacturing. As such, POMS is likely to test the relationship between IS departments and engineers working on the factory floor by forcing a closer union between them.

What POMS will do for IS directors, according to Bruce Richardson, vice president at Advanced Manufacturing Research Inc., a consulting firm based in Cambridge, Mass., is give them access to data that will improve business applications, like generating reports and analyzing trends. "Before, he's [the IS director] never had a clue on how to get that data up from the shop floor," Richardson says.

When the product is shipped, probably in December, a network of IBM PS/2 personal computers running the OS/2 Extended Edition operating system will serve as the POMS platform. The network will connect data acquired from the programmable logic controllers on the factory floor to applications running on an IBM AS/400, 370 or other vendor's host anywhere in the company. Users will be able to purchase POMS for $4,900 per workstation; site licenses will also be available.

POMS will serve as a proving ground for IBM's pledge that SAA will offer solutions

A HAPPY UNION: Campbell Soup Co. ensured a healthy partnership between IS and engineering for the POMS project by hiring engineer Alan Carr (seated) from the R&D division as manager of CIM. Also important, says Rob Cohen, director of MIS development services, are Campbell's high-level champions of CIM.

Photograph by Sal Di Marco

including competitors' products, according to Incode's president Grina. "There's a huge emphasis [in the POMS development] on standards, connectivity and networking. POMS is an IBM product, but it has to operate in a multivendor environment," he says. "Our emphasis from a marketing point of view is the IBM midrange, but customers are already talking about interfacing from Hewlett-Packard or Digital Equipment midrange machines."

Rather than rely on traditional venture funding to develop the product, Grina and Minor, Incode's chief executive officer, struck an agreement with IBM's Process Industries group in Valhalla, N.Y., and a consortium of five process manufacturers. Under the agreement, Incode will own the POMS software, and IBM will have marketing rights. Such agreements, which team entrepreneurial software developers, big system vendors and big customers to develop critical applications, are becoming more common.

The five manufacturers—Campbell Soup Co., Johnson & Johnson, Nestle Food Corp., Ralston Purina Co. and SmithKline & French Laboratories International—will be test-beds for POMS. They and IBM's Process Industries group are contributing the equivalent of 43 full-time people to validate, review the design and conduct alpha and beta testing, says Incode's Grina. A 15-member development team at Incode is handling the design, documentation and coding, which the company estimates will take about two years and about $2.5 million to complete.

> ☐ **POMS IS AN IBM PRODUCT, BUT IT HAS TO OPERATE IN A MULTI-VENDOR ENVIRONMENT.**

In exchange for some capital and their participation in the software's development, the five process manufacturers will get an enterprisewide license to use the code, Grina says. Walt Carey, director of manufacturing systems development at Nestle Foods, sees an additional advantage for his company. By participating in the development, Nestle gets a product tailored to its needs. "That's one of the major factors," Carey says. "We wanted to have input so that this system would be useful to us."

From the developer's point of view, the arrangement is ideal, partly because it provides a pool of industrial expertise and partly because it frees Incode of pressures to turn a quick profit. "It's a venture opportunity, but there's no outside venture capital. We don't have to deal with bankers and venture capitalists," Grina says. "It's a nice way to develop software."

If POMS provides the seamless integration its developers promise, it could help IBM keep what the Boston-based market research firm Yankee Group says is an overall lead in the industrial-computing marketplace, which comprises plant floor and factorywide systems. But IBM's primary competitor in this market, Digital, leads Big Blue by a healthy margin in several categories.

For example, IBM holds a comfortable 52% share of the market for plant floor monitoring and control systems in process industries, according to the Yankee Group. But when it comes to the total population of those plant floor systems for all areas of manufacturing, its 24% share lags behind Digital's 33.5% share (see chart, "Building on a Strength in Process Industries").

Increasing its installed hardware base in the manufacturing arena is an obvious goal, agrees IBM's Reed Finn, one of the company's support representatives for the process industry. "We know that there are over 16,000 [process-manufacturing] plants in the U.S. with over 100 employees. That's a number that certainly gains our attention," he says.

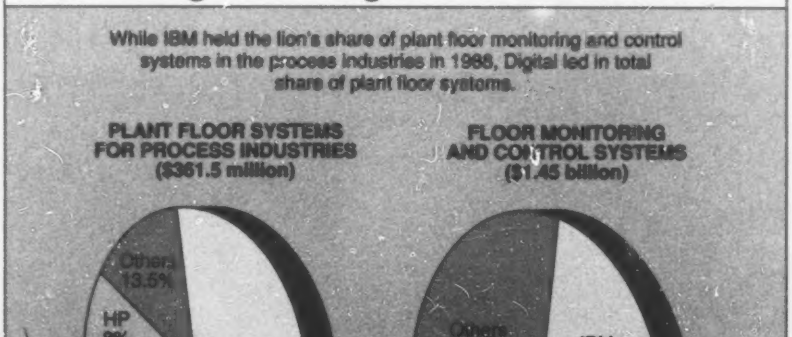
POMS as an SAA Building Block

When POMS ships as one of the first SAA applications, it will incorporate many SAA building blocks, including OS/2 Extended Edition, and Presentation Manager. IBM hopes the software will be successful enough to boost SAA's popularity, Finn says. "We think this application will be a good demonstration [of SAA]."

Advanced Manufacturing's Richardson sees POMS as more than simply a validation of SAA. It has the potential to lock in third-party developers that build applications to run on top of POMS, he says.

Some of the consortium's participants are already recruiting additional developers. Marcam Corp. of Newton, Mass., was brought in at the outset to produce an interface to Prism, Marcam's popular material requirements planning (MRP) system for process industries. Nestle Foods cut a separate deal with Exsys Inc. of Albuquerque, N.M., to create an interface to POMS for Exsys' expert system software. These are early entries in what developers hope will be a full catalog of add-on products. "What they [IBM] will

Building on a Strength in Process Industries


While IBM held the lion's share of plant floor monitoring and control systems in the process industries in 1988, Digital led in total share of plant floor systems.

Source: The Yankee Group.

end up with," says Richardson, "is a network of [SAA] evangelists."

In fact, John Campbell, executive vice president at Marcam, sounds a bit evangelical. "Engineers come out of a background using DECs, and they think that's the only box that they can use on the shop floor, but I think IBM has proven that the PS/2 is a pretty viable piece of equipment," he says.

IBM may be hoping that POMS will be further proof of PS/2 viability, particularly in its competition with Digital. "Think of it as a direct bull's-eye on VMS," Richardson says.

At Digital, IBM's move to an integrated environment in the process industry is viewed as a game of catch up. "Network Application Support [Digital's integrated environment] allows you to integrate every application in your network," says Don Jenkins, development manager for the company's computer-integrated manufacturing (CIM) marketing and product development organization.

Marcam's Campbell concedes Digital's lead in providing connectivity, but adds that it has been missing the applications. "Their [Digital's] attitude is 'roll your own. We'll give you the boxes, we'll give you all the connectivity, and you go out and figure out what the solution is.' "

Digital's Jenkins counters that process manufacturers are so complex and varied that any packaged solution is going to require customization. "Excellent solutions are not static," Jenkins says.

> ☐ THE PLANT GUYS HATE MIS AND MIS HATES THE PLANT GUYS. IRONICALLY IBM WILL LINK THEM.

POMS Creates IS Challenge

Indeed, in linking business applications to the factory floor, CIM applications like POMS are creating new challenges for IS departments in process manufacturing companies.

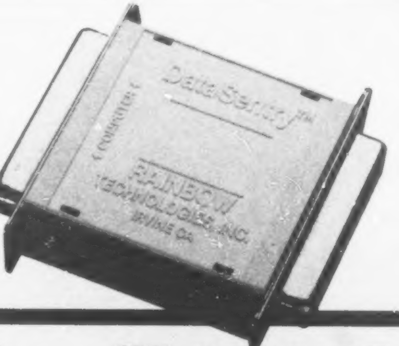
"Traditionally, there has not been a good track record of [IS and plant floor staff] working together. It's going to take a lot of commitment on the part of these people to break down barriers," Incode's Grina says.

Richardson sees a sort of demilitarized zone between the two environments. "It's always been two worlds—the plant guys hate MIS, and MIS hates the plant guys. Ironically, IBM is going to link them," he says.

Paul Ross, director of information services at Ortho Pharmaceutical Corp., a subsidiary of Johnson & Johnson, has observed similar issues surrounding the process industry's move to CIM via systems like POMS.

"Engineers are beginning to want to manipulate and analyze data collected on the factory floor in more meaningful ways. To do that, they need to get to a higher level," Ross says. That means connecting to the corporate host, which is typically ruled by IS.

Only time will tell how that new trend will change the IS director's life, Ross says. "This is all new territory. I don't think any of the players understand their new roles or how it's going to come together," he says. "Nobody knows what it means right now." ▭



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